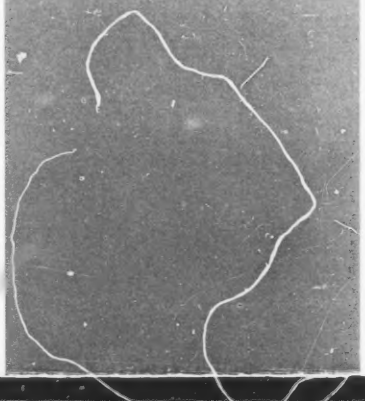
American Iron and Steel Institute

Steel at the Crossroads: The American Steel Industry in the 1980s



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Steel at the Crossroads: The American Steel Industry in the 1980's

Prepared by
American Iron and Steel Institute
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PREFACE

This study describes the problems facing the American steel industry, discusses what steel companies are doing to solve them, and recommends appropriate public policies to ensure that the United States will have a strong steel industry in the years ahead.

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Executive Summary

Steel at the Crossroads: The American Steel Industry in the 1980s

A statement by the member companies of the American Iron and Steel Institute, published January, 1980

The American steel industry is beset by serious difficulties — as are most of its counterparts throughout the world. Yet the domestic industry has the potential to surmount those difficulties and emerge healthy, strong, and vigorous.

The government, whose policies have contributed to the industry's present plight, has evidenced increased awareness of the steel industry's problems in recent years. But much more action by the government is needed, *and needed now*, to cope with identified problem areas.

Government policies and programs designed to enhance rather than impede the steel industry's self-improvement efforts will enable the domestic steel industry to be a positive economic force in the decade of the 1980s. *The time for decisive action is now.*

America Needs a Strong, Healthy Steel Industry

Steel is mankind's most important industrial material. It is essential to all modern societies. A nation's steel supply must be secure, and it is not secure if it is dependent to any significant degree on foreign sources. Excessive dependence on imported steel could ultimately be as damaging to the American economy as excessive dependence on imported petroleum is today.

The American Steel Industry Is Efficient Today, But Is Losing Its Competitive Edge

The American steel industry is efficient today, by global standards, and is competitive with most of its world-wide rivals. Indeed, under recent actual operating conditions, the industry has been and is a lower cost steel supplier to domestic markets than most of its foreign competitors.

Clearly, however, the domestic industry has been "losing its competitive edge". Some of the primary reasons, closely interrelated, are:

- Persistently low rates of return coupled with outdated tax measures that fail to provide adequate capital recovery;
- Capture of a significant portion of the domestic market by steel imports at "dumping prices";
- Excessive government control and regulation, which significantly increase steelmaking costs and mandate the spending of funds that would otherwise be available for replacement and modernization of productive equipment;
- Reduced earnings as a result of unwarranted government interference in the marketplace determination of steel prices, which has restricted the recovery of cost increases;
- Escalation of steelmaking costs at a rate in excess of increases in steel prices.

Unless these detrimental conditions are promptly alleviated, a further decline of the domestic industry would appear to be inevitable, with tragic consequences for workers, firms and communities as well as the overall economy of the nation.

Given the appropriate government policies, the American steel industry can retain the "competitive edge" that has made it the world leader for most of this century.

Inadequate Capital Formation Is a Problem for the American Economy — and for the Steel Industry

The nation has been lagging in capital investment. Inadequate capital formation in any industry produces meager gains in productivity, upward pressure on prices, sluggish job creation, and faltering economic growth. Those effects have been magnified in the steel industry.

Lagging capital spending because of inadequate capital formation has injured the steel industry in two ways:

- It has prevented adequate replacement and modernization of steelmaking facilities, thus hobbling the industry's productivity and efficiency;

- It has hampered steel-intensive capital spending by other industries thereby reducing the market for steel products.

World Steel Demand in the 1980s

Various authorities have forecast growth in both world and domestic demand for steel over the next decade. Because of the slower pace of steel capacity expansion over the past five years, caused by the persistent "recession" in the world steel industry, it is likely there will be much closer balance in world steel demand and supply in the 1980s. This could have grave consequences for the U. S. economy, unless the domestic steel industry is capable of satisfying most of the domestic demand. American steel users cannot afford to be at the mercy of foreign suppliers during periods of tight supply.

The American Steel Industry at the Crossroads

How the American steel industry responds to the challenges lying ahead will to a large degree be dependent on the policies and actions of the U. S. government.

Two scenarios have been constructed to contrast possible developments over the next decade. Scenario I ("Aggressive Revitalization") portrays circumstances, including appropriate government policies, in which individual producers would improve their earnings, generate more capital, devote much greater resources to modernization, efficiency improvements, and expansion of capacity, and over the longer term provide significant benefits to steel consumers.

Scenario II ("A Continuation of Current Trends"), portrays what could happen with no significant changes in government policies: unprecedented reliances on imported steel, a huge steel trade deficit, an accelerating decline in the industry's efficiency and competitiveness, further facility closedowns, and substantial job losses in both steel manufacturing and related support industries.

Scenario I Has Beneficial Results Whereas Scenario II Has Harmful Results

		1988	
	1978	Scenario I	Scenario II
Apparent Steel Consumption (millions tons)	117	134	134
Domestic Shipments (million tons)	98	117	as low as 85
Imports (millions tons)	21	20	as high as 50
Exports (millions tons)	2	3	2
Imports as a Percent Of Apparent Consumption	18%	15%	as high as 40%
Raw Steel Capacity	158	168	as low as 130
Employees in Steel Operations (thousands)	449	427	as low as 360
Steel Trade Deficit (1978 $) ($ billions at $400/ton)	$7.5*	$7	as high as $20

*Actual 1978 deficit was $5.6 billion (at $300/ton)

Steel producers regard the strong and healthy steel industry resulting from the rapid modernization program illustrated in Scenario I to be in everyone's best interest. However, a scaled-down industry as depicted in Scenario II is a real possibility that could occur if no significant changes are made in governmental policies.

$7 Billion Per Year Will Be Required to Modernize the American Steel Industry

The kind of modernization and revitalization program needed to realize the bright prospects of Scenario I would involve annual capital requirements substantially greater than the industry's average annual capital spending of $2.9 billion (1978 $) during the last decade. Stated in 1978 dollars, the industry's total average annual requirements should approximate $4.4 billion for the modernization and replacement of steelmaking facilities, $0.5 billion for expansion of capacity, $0.8 billion to meet environmental and health-related demands, and $1.3 billion for nonsteel and other requirements such as debt servicing — a total of $7 billion per year on average.

The Steel Industry Requires Higher Rates Of Return and More Rapid Capital Recovery to Meet Capital Requirements of $7 Billion Per Year

A number of conditions must prevail in order for the American steel industry to meet capital requirements averaging $7 billion per year. Of critical importance, rates of return must be improved and measures must be implemented to encourage and enhance rapid capital recovery.

More rapid capital recovery allowances can be beneficial, but only to the extent that there is sufficient income to use these allowances. Steel companies' earnings are and have been at such depressed levels that there would not be sufficient gross income to permit appreciable benefits from tax law revisions designed to enhance capital recovery. Analysis indicates that the industry must have increases in real revenues sufficient to generate the competitive rates of return that justify the large scale investments required year after year for industry modernization. These increases, at the same time, should provide sufficient income to permit steel companies to utilize more rapid capital recovery.

By the end of the projected revitalization period, the gains in production efficiency would be sufficient to provide the industry with competitive rates of return while at the same time providing steel consumers with prices much lower than would otherwise be the case. The ultimate effects of more rapid capital recovery are therefore *anti-inflationary*.

The U. S. Should Support an Open World Trade System, but Ensure Its Fairness to All Nations

The industry urges vigorous enforcement of U.S. trade laws, and the use of some improved mechanism to prevent steel imports from reaching levels that

would not be tolerated by other nations and should not be tolerated by the U.S. The TPM needs substantial changes from its present form. Only with major revisions can the TPM become an effective trade law enforcement instrument.

The industry endorses negotiation with other nations of an International Safeguards Code, full commitment to utilization of the OECD Steel Committee, formulation of coherent and sensible steel trade policies vis-a-vis developing and centrally planned economies, and establishment of an international commodity trade policy.

Revitalization of the Steel Industry Will Significantly Reduce Its Energy Requirements

A modernized domestic steel industry would yield important benefits in the conservation and optimal use of energy, and thus contribute to the nation's energy goals. The domestic steel industry is, by its very nature, a large consumer of energy (about 4-5% of total domestic consumption), and has long been committed to diligent energy conservation efforts. Only far-reaching modernization, however, can produce further energy economies of real significance.

More rational and sensible national energy policies are needed, including measures that would encourage greater reliance on coal, modify environmental demands that aggravate energy problems, and reduce Federal intervention that tends to discourage and impede the expansion of energy development and production.

Market Forces Should Determine The Allocation of Raw Materials

International flows of scarce and vital raw materials likewise have been impeded and distorted by various forms of intervention by our own and foreign governments. Supplies of critical materials beyond the requirements of producing nations should be available to others through market forces rather than government edicts.

The Nation's Environmental and Industrial Health Policies Must Fully Recognize Economic Realities

By their very nature, steelmaking processes incidentally generate large volumes of pollutants. The American steel industry has already spent huge sums and implemented far-reaching and effective programs to protect the environment and reduce hazards. Although environmental benefits have been obtained, these expenditures have diverted capital from income-producing and cost-reduction applications. Meeting environmental standards has also had an inflationary impact by significantly increasing operating costs of producing steel. Therefore, in view of the great progress that has been made, and at tremendous cost, the industry urges that the regulatory framework be modified to mandate only those requirements that are demonstrably necessary to protect public health, and that can be rationally justified on a cost-benefit basis.

Market Forces Should Establish The Level of Steel Prices

Many years of government interference in steel company pricing decisions — to an extent unknown to companies in most other industries — have held down the industry's revenues and earnings during cyclical periods when market conditions would have permitted higher returns. Such policies have condemned the industry to a condition of chronically depressed earnings, and have impaired its ability to generate capital for investment.

★ ★ ★

Summary of Key Policy Recommendations

The member companies of the American Iron and Steel Institute strongly recommend that the appropriate government authorities implement a number of measures that are critically needed to enable the companies to embark on modernization and revitalization programs as described above. Those measures are as follows:

- Policies that would encourage and permit steel companies to achieve competitive rates of return, accompanied by provisions for accelerated capital recovery.
- Modifications of government-mandated regulatory programs (notably environmental) that would reduce non-income-producing capital demands;
- Firm assurances that imported steels, either by excessive volumes or unfair pricing, will not disrupt the domestic steel market, particularly during the industry's revitalization effort.

It must be emphasized that effective measures in not one or two but *all three* critical areas are urgently needed.

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America Needs a Strong, Healthy Steel Industry

. . . Steel is the world's most important industrial material. A strong American steel industry is essential for a strong American economy. America cannot afford to rely heavily on foreign steel, lest we become as dependent tomorrow on imported steel as we are today on imported oil.

A. The "Steel Age"

Historians have identified the progress of mankind by referring to "ages" named for the predominant material used to produce tools and weapons during a given period. First there was the "Stone Age" followed by the "Bronze Age" and then the "Iron Age". Future historians could well consider the past hundred years or so, plus some indefinite period into the future, as the "Steel Age".

Steel has long been the world's most important industrial material. For many decades it has accounted for more than 90% of the total production of all metals, including industrial metals such as aluminum, copper, lead, and zinc, and precious metals such as gold, platinum, and silver.

B. Steel — Backbone of Industrial America

Worldwide raw steel production was a record 785 million net tons in 1978, including 137 million tons in the United States. To achieve this level of output, American steel companies employed a total of nearly 600,000 people (449,000 were engaged in steel production); paid wages and salaries of $12.4 billion; supplied about 40,000 metalworking plants; purchased nearly $26 billion of materials, supplies, and services from others; paid $533 million in dividends to 800,000 stockholders; and earned $1.3 billion on revenues of $46.9 billion. This was a return of 2.8% on sales and 7.3% on stockholders' equity. These returns compare with 5.2% on sales and 15.9% on stockholders' equity for all manufacturing industries.

In recent years, the steel industry has provided 4-5% of the payrolls, value added, value of shipments, and capital expenditures of all manufacturing industries. It has accounted for about 3% of the Federal Reserve Board's Index of Industrial Production, and value added by the industry represents about 1% of total Gross National Product. Steel is one of the largest industries in the nation, exceeded only by automotive, petroleum, and food.

Finished steel products are critical raw materials for most major segments of the economy: manufacturing, construction, mining, energy, transportation, and agriculture. Only steel has the physical characteristics of strength, formability, toughness, rigidity, weldability, and resistance to heat and cold — all at a price low enough to be used in such a myriad of applications.

It is difficult to imagine earthquake-proof high-rise buildings, long-span bridges, freight cars, locomotives, ships, passenger cars, trucks, machinery, tractors and other farm implements, washing machines, refrigerators, dishwashers, and most other durable products being produced without steel. Steel is almost always an integral part of these products. They are produced by facilities made of steel. And. they are transported in vehicles made of steel.

Steel is vital to the exploration, production, and distribution of almost all types of energy. This is true of existing energy sources as well as the new sources expected to be important in supplying future energy needs.

A glance around any office or home will illustrate the widespread usage of steel in all aspects of life. People who work in offices typically sit on steel chairs at steel desks. The file cabinets, waste baskets, bookcases, and other furniture are largely, if not entirely made of steel. Typewriters, copy machines, and other equipment — even paper clips and staples — are steel.

In a home, the furnace, air conditioner, gutters, downspouts, flashing, and much of the pipe is often steel. Nails and staples are used extensively throughout a house. Most of the appliances, furniture, pots, pans, and cutlery are steel.

C. Role of the Steel Industry in National Defense

Steel is critically important to the nation's security. Military defense depends on steel, since almost every item of military equipment contains steel components for which no acceptable substitutes are known. The economy's ability to equip and move military forces and to maintain a satisfactory level of support activities is equally dependent on steel.

National security also depends on economic strength. Without an adequate and continuing supply of steel products, a strong economy could not exist.

A statement of the President's Materials Policy Commission in 1952 (often referred to as the Paley Commission Report) remains equally true today:

> "The Nation must maintain a strong and expanding economy with a large and diversified materials base that can be tapped for

war production, with special attention to providing prime essentials such as steel, electricity, petroleum, and aluminum whose expansion take considerable time and whose production sets the pace not only for economic growth, but also for production in wartime."[1]

D. Risk of Dependence on Foreign Sources for Steel

Steel's position in the overall economy is in many respects similar to that of the petroleum industry in the mid-Sixties, when imports of oil represented close to 20% of domestic consumption — about the same as the 18% steel import penetration in 1978. Both steel and oil are critical to the nation's security in terms of economic well-being and military defense. Both were among the first products to be put on allocation during times of national emergency. The reasons for this are clear: the American economy would be crippled without either steel or oil.

The nation is currently suffering through an attempt to solve the problem of reducing its dependence on foreign oil. This emergency probably could have been avoided or greatly reduced if appropriate actions had been taken in the past. In the future, should domestic steel capacity fail to serve growing markets, this nation would necessarily become more and more dependent on foreign steel, as we are with oil. Before long, the nation would become hostage to foreign suppliers for a product whose demand is more cyclical than oil. Compared with oil, there is less opportunity to rely on conservation to offset the negative impact of a steel shortage. Thus, any continuing shortage of steel that might result from actions of foreign suppliers could be more damaging to the overall economy than the present situation with oil. Inadequate supplies of steel would force a substantial reduction in industrial activity. Unemployment would increase. As with oil, shortages of steel would inevitably cause prices to rise.

Arriving at long-term solutions to inadequate steel supplies can be less difficult than finding satisfactory solutions to inadequate oil supplies. This is because the major raw materials used in steelmaking are virtually inexhaustible, widely and readily available, and relatively inexpensive. In addition, steel can be and is readily recycled. Finally, the United States can control the availability of steel far more easily than it can control the availability of oil.

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[1] President's Materials Policy Commission, **Resources for Freedom**, June 1952, page 153, Government Printing Office.

II The American Steel Industry Is Efficient Today, But Is Losing Its Competitive Edge

. . . Although the American steel industry is efficient today, its financial results have been deteriorating in recent years. Its competitive position has weakened and the industry is in danger of losing its position as the low-cost producer for domestic markets.

. . . Rates of return for companies in the industry have declined substantially. Capital investment has been inadequate. Some steel plants have been closed permanently—and many jobs have been lost.

. . . These developments have resulted from insufficient cash flow due to low rates of return and inadequate tax law provisions for capital cost recovery . . . high levels of steel imports at dumped prices . . . high costs of compliance with government controls and regulations . . . and government constraints on steel prices.

A. Competitive Position of the Steel Industry

For the past 100 years, the American steel industry has effectively and efficiently served American steel consumers as the lowest cost supplier of high-quality steel in sufficient volume to meet virtually all domestic requirements. However, over the past 25 years the industry has been steadily losing a portion of the domestic market to foreign producers, and the competitive advantage that it historically held is now in danger of being lost. Unless appropriate government policies are forthcoming, especially in the area of capital formation, the American steel industry may be forced to drastically reduce its steel production capability in an effort to remain financially solvent.

1. *Efficiency of Domestic vs. Foreign Producers*

a. Comparison of Steel Production Costs

On the basis of actual production costs, the American steel industry is a lower cost steel supplier to domestic markets than its major foreign competitors. The actual production costs of foreign steel producers shown in Table II-1 exclude approximately $60 per net ton of shipping and duty charges for delivering finished steel products to the United States. These estimates are based on actual operating rates, which have been relatively low in Japan and the EEC in recent years.

b. Comparison of Operating Rates

The average operating rate of American steel companies has been higher than the rate for steel companies in Japan and the EEC in most of the years during 1973-78:

TABLE II-1

The American Steel Industry Is a Lower Cost Producer For Domestic Markets Than Its Major Foreign Competitors

	Estimated Production Costs, Excluding Shipping* (Per Net Ton of Finished Carbon Steel Product)	
	1978	1979 (1st. Q)
U.S.A.	$359	$382
Japan	372	369
West Germany	386	426
France	414	416
United Kingdom	417	465

*Based on actual operating rates during the period. Excludes approximately $60 per net ton shipping and duty charges for delivery to the U.S.A.

Source: Marcus, Peter F. and Kirsis, Karlis M., Paine Webber Mitchell Hutchins Inc., **World Steel Dynamics**, September 1979, p. J-1-5 (hereinafter referred to as **World Steel Dynamics**).

TABLE II-2

During Recent Years the Operating Rate of the American Steel Industry Has Been Significantly Higher Than in Japan and the EEC (Operating Rate As % of Capability)

	U.S.A.	Japan*	EEC
1973	97	94	86
1974	94	89	87
1975	76	78	66
1976	81	77	68
1977	78	67	63
1978	86	68	66

*Excludes Electric Furnace.

Source: American Iron and Steel Institute; **World Steel Dynamics**; *Council on Wage and Price Stability*; *Eurostat*.

c. Comparison of Profitability

Profitability of the companies in the American steel industry has been very low when compared with the level of profitability experienced by all manufacturing industries in the United States. However, the domestic industry has had better profit performance than its major foreign competitors, which provides further evidence of its relative efficiency and competitive edge. Table II-3 compares net income as a percent of net fixed assets for the American steel industry and its major foreign competitors. (Because of different financing arrangements and foreign government support programs, return on equity is not a good basis for international comparisons.)

The American steel industry's relatively better profit performance is further documented by the fact that in 1978 approximately one-third of the 47 largest foreign steel companies reported losses — in most cases, staggering losses — while the remaining companies generally reported only token profits.[1]

[1] **Fortune**, August 13, 1979, p. 193.

European steel companies reported the largest losses, and Japanese steel companies reported very small profits. The total net loss in 1978 for these largest 47 foreign steel companies was $1.6 billion, essentially the same as in 1977 when the largest 46 foreign steel companies reported a loss of $1.6

TABLE II-3

Profitability of the American Steel Industry, Although Very Low, Is Higher Than Its Foreign Competitors (1969 — 1977)*

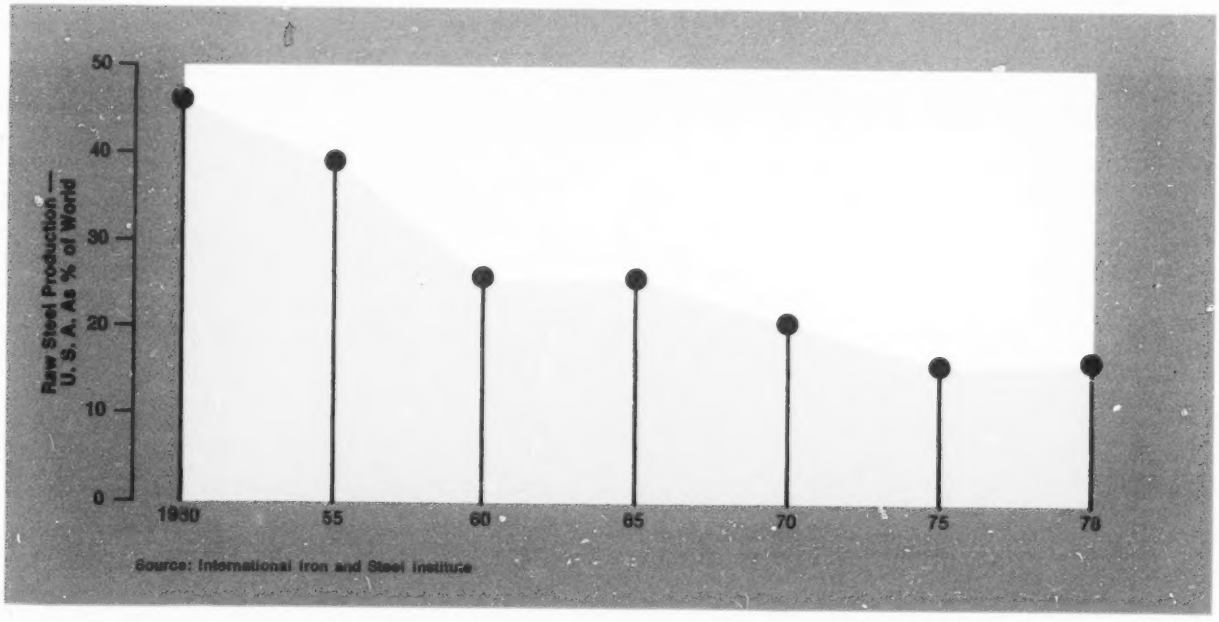
	Net Income As % Of Net Fixed Assets
U.S.A.	6.7
Japan	1.7
West Germany	2.9
United Kingdom	—5.3
France (1972-76)	—8.3

*Fiscal Years

Source: International Iron and Steel Institute

CHART II-1

U.S. Share of World Steel Production Has Dramatically Declined



billion.[2] American steel companies reported profits totalling $1.3 billion in 1978.[3]

2. Evidence That the American Steel Industry Is Losing Its Competitive Edge

a. Position as a World Steel Producer

The American steel industry has lost the dominant position it once enjoyed among world steel producers. Following World War II, the domestic industry accounted for over half of total world steel production. That position has eroded steadily as new steel industries have sprung up in a number of developing countries and existing steel capacity in Japan, Europe, and elsewhere has been rebuilt and expanded. As shown in Chart II-1, this erosion has continued during the past 15 years as U. S. production remained relatively flat, while world production has grown considerably.

In 1978, American production of 137 million tons of raw steel was second only to the U.S.S.R., which produced 167 million tons of raw steel. Japan was in third place among world producers, with 1978 production of 113 million tons. In total, these three countries produced just over half of the world's total steel output. EEC countries produced 146 million tons, accounting for another 19% of total world steel production.

As shown in Table II-4, steel imports made their first significant inroads into the American marketplace in the late 1950s and early 1960s. Domestic steel consumers first turned to foreign producers primarily because they feared domestic supply interruptions due to possible domestic steel industry labor strikes.

TABLE II-4

Growth In the Domestic Market Has Been Lost to Foreign Steel Producers (Million Net Tons)

Year	Domestic Shipments + Imports — Exports	Imports	Imports As % Of Apparent Steel Supply	Balance Of Trade (Exports Less Imports)
1950-55 Avg.	72.6	1.3	1.8%	+ 2.0
1956-60 Avg.	71.8	2.4	3.3	+ 1.0
1961-65 Avg.	82.5	5.9	7.2	— 3.5
1966-70 Avg.	101.5	13.5	13.3	— 9.9
1971	102.5	18.3	17.9	—15.5
1972	106.6	17.7	16.6	—14.8
1973	122.5	15.2	12.4	—11.1
1974	119.6	16.0	13.4	—10.1
1975	89.0	12.0	13.5	— 9.1
1976	101.1	14.3	14.1	—11.6
1977	108.5	19.3	17.8	—17.3
1978	116.6	21.1	18.1	—18.7

Source: American Iron and Steel Institute, **Annual Statistical Reports**.

The loss of the growth in the domestic market to foreign steel producers has not only harmed domestic steel companies but it has also had a very significant adverse effect on the nation's balance of trade.

As shown in Chart II-2, foreign steel captured its largest share of the U. S. market in 1971, 1977, and 1978 — all years when the American steel industry operated at relatively low rates of capacity utilization. In those three years, the domestic industry shipped an average of 92 million tons, while imports averaged 17.9% of the market. In 1973 and 1974, however, the domestic industry's highest volume years ever, imports made up 12.9% of the market while the American industry shipped an average of 110 million tons. During those two years, the U. S. economy experienced shortages of steel mill products as overseas producers diverted their steel production away from the U. S. market to their own economies and to other steel-consuming countries.

Worldwide, the steel industry has a high level of fixed costs. This severely restricts profits during periods of low capacity utilization. Accordingly, if foreign producers "dump" in the U. S. market to utilize their capacity more effectively, domestic unit production costs increase and domestic profits decline.

Today, the United States is the only major industrial nation unable to supply all its own steel requirements. As a result, some imports are now needed just to meet the domestic economy's normal steel requirements. Unfortunately, the level of imports entering the U. S. is more closely tied to the political and economic objectives of foreign governments than to the needs of American steel consumers.

b. Steel Industry Employment and Plant Closings

Employment by American steel companies in the production and sale of steel products has declined from 544,000 in 1969 to 449,000 in 1978 — a decline of 17%. There are many causes for this downward trend in employment. Of major importance has been the growth of steel imports. It is estimated that every million tons of imports displace 4,000 to 5,000 domestic steel industry employees. On this basis the current level of imports has displaced approximately 100,000 steel company employees over the past 20 years.

The effect of paying unemployment benefits to laid-off steelworkers is that the U. S. economy pays *twice* for the labor component in imports — once when the importer pays the exporter for the steel, and once again when those laid off in the industry are paid lay-off and/or adjustment assistance benefits.

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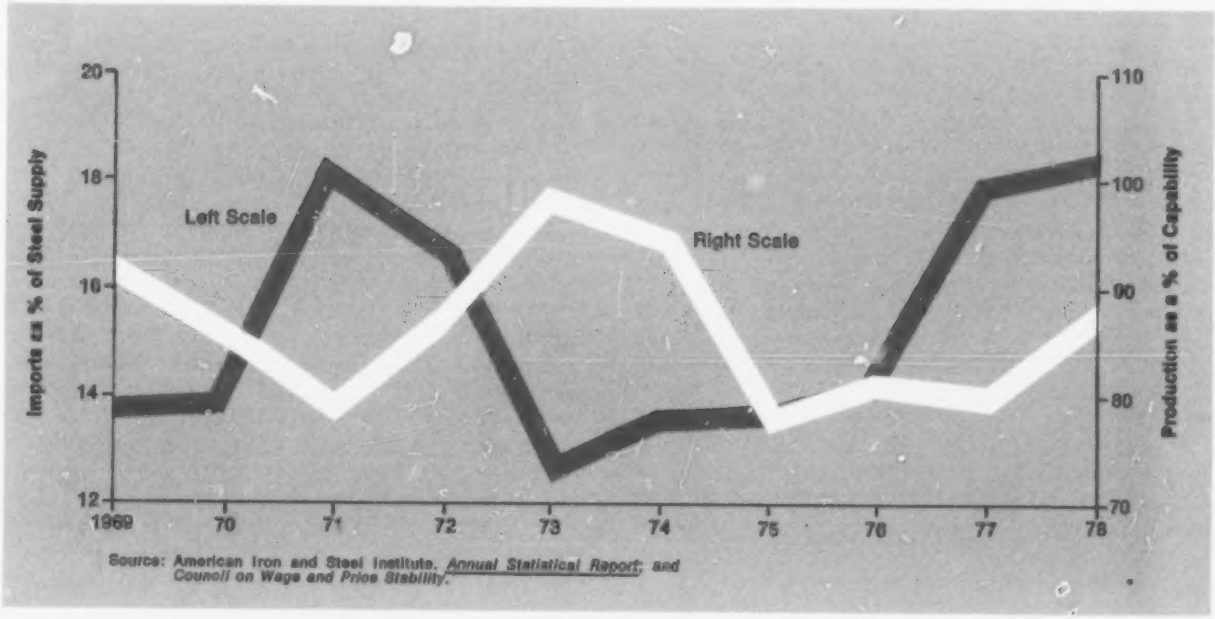
[2] **Ibid.**, pp. 194-203.

[3] American Iron and Steel Institute, **Annual Statistical Report**, 1978, p. 8.

CHART II-2

Domestic Capacity Utilization Has Been Low When Steel Imports Have Been High



Source: American Iron and Steel Institute, *Annual Statistical Report*; and Council on Wage and Price Stability.

TABLE II-5

Many Employees Have Been Affected By Steel Facility Closings

Company	Location	Estimated Number
U. S. Steel	Duluth (MN) Ellwood City (PA) Youngstown (OH) Torrance (CA) Waukegan (IL) Joliet (IL) and elsewhere	13,300
Bethlehem Steel	Johnstown (PA) Lackawanna (NY) and elsewhere	12,000
Youngstown Sheet & Tube	Youngstown (OH)	5,000
Alan Wood Steel	Conshohocken (PA)	3,000
Cyclops Corp.	Mansfield (OH) and Portsmouth (OH)	1,300
Phoenix Steel	Phoenixville (PA)	700

Source: Individual American steel companies.

A development closely related to imports — particularly in recent years — has been the permanent shut-down of certain steel plants and many steel production facilities. The overall effect of these closings on employment cannot be precisely determined because affected personnel may gain employment elsewhere, but Table II-5 lists some of the more widely publicized facility closings in recent years and the number of employees directly affected.

c. Financial Performance Of The Steel Industry

Throughout the past two decades, except for 1974, the steel industry's percent return on net worth was substantially below the average for all manufacturing. During most of this period, steel's rate of return was at or near the bottom of all manufacturing industries.

Because of the low level of profits during much of the last two decades, many domestic steel companies found it necessary to reduce dividends, especially in 1977 and 1978.

TABLE II-6

Steel Industry Profitability Has Declined Substantially and Has Been Far Below All Manufacturing During the Past Two Decades (1950-1978)

Period	Average % Return On Net Worth	
	Steel	All Manufacturing
1950-1954	11.5	13.8
1955-1959	11.8	12.6
1960-1964	7.2	11.1
1965-1969	8.5	13.3
1970-1974	8.4	12.6
1975-1978	8.2	14.6

Source: Citibank, N.A., **Monthly Economic Letter** (April issues)

d. Labor Productivity And Energy Efficiency

Two key elements in the cost of producing steel — labor productivity and energy efficiency — have shown unfavorable recent trends when the domestic industry is compared to foreign steel producers.

(1) Labor Productivity

As shown in Table II-7, manhours per net ton of finished steel shipments have improved significantly in Japan during the past 10 years and are now approximately the same as for the domestic industry. Other major world steel producers have improved also, but remain behind Japan and the United States.

TABLE II-7

Labor Productivity In Japan Has Improved Significantly During the Past 10 Years to About The Same Level as the Domestic Industry

(Manhours Per Net Ton of Finished Carbon Steel — Integrated Plants)

	1969	1978	Annual Productivity Improvements
1. **Based on Actual Operation Rates**			
U.S.A.	9.6	7.8	2.2%
Japan	13.3	8.9	4.4
West Germany	11.6	10.7	.9
United Kingdom	20.6	21.1	(.3)
France	17.6	12.8	3.5
2. **Based on Standard (90%) Operating Rates**			
U.S.A.	9.6	7.7	2.4%
Japan	13.1	7.3	6.4
West Germany	12.4	9.4	3.1
United Kingdom	21.1	16.5	2.7
France	17.8	11.9	4.4

Source: **World Steel Dynamics**

(2) Energy Efficiency

Currently, energy costs comprise about 20% of total steel production costs. However, in recent years energy costs have risen dramatically, in spite of improved efficiencies, and energy costs could become an increasingly larger portion of total steel production costs. Table II-8 compares the energy efficiency of the domestic steel industry with its major foreign competitors.

TABLE II-8

The American Steel Industry Needs to Become More Energy Efficient (1977)

	Million BTU's Per Net Ton Of Shipments*
U.S.A.	36.7
Japan	30.4
West Germany	35.5
United Kingdom	39.1
France	38.0

*Sales of energy are not deducted from these totals.

Source: **World Steel Dynamics.**

e. Capital Expenditures by Domestic and Foreign Steel Producers

For a number of reasons, all of which have contributed to the inadequate level of capital formation, the American steel industry has not been able to invest in new plant and equipment to the same extent as its major foreign competitors:

TABLE II-9

The Domestic Industry's Capital Expenditures Have Been Far Less Than Its Foreign Competitors' (1972-1977)

	$ Per Net Ton Of Raw Steel Production
U.S.A.	$19
Japan	26
West Germany	24
United Kingdom	35
France (1972-76)	28

Source: International Iron and Steel Institute

B. Why the American Steel Industry Is Losing Its Competitive Edge

Although the American steel industry remains the low-cost supplier to domestic markets, compared to its major foreign competitors, it has recently been losing its competitive edge because of several interrelated reasons:

- Insufficient cash flow due to low rates of return and inadequate tax law provisions for capital recovery.
- Capture of a large part of the domestic market by steel imports at "dumping" prices.
- Excessive government control and regulations, which significantly increase steelmaking costs

and mandate the spending of funds that would otherwise be available for replacement and modernization of productive equipment.

- Unwarranted interference of government in the marketplace determination of steel prices, thus squeezing profits.
- Costs of steel production have increased more rapidly than have steel prices.

1. *Inadequate Tax Law Provisions for Recovery of Capital Investment*

A fundamental cause of the loss of competitive edge currently being experienced by the steel industry is the inadequacy of tax law provisions for the recovery of capital. Chapter III discusses the problem of capital formation in detail, and Chapter VII recommends tax law revisions. A brief discussion of the problem follows.

Recovery of capital through depreciation involves the systematic write-off of the original purchase price of plant and equipment as a necessary cost of doing business. The Federal income tax laws were written during a period when inflation was not a significant economic factor affecting the replacement cost of plant and equipment. In recent years, however, inflation has become severe. It now costs approximately two to three times as much as it did in the 1960s to replace plant and equipment.

Federal income tax laws do not provide for the impact of inflation on plant and equipment replacement cost. For this reason, present income tax law does not recognize the true or full cost of doing business. Because costs are understated, profits are overstated and — even worse — so too are the taxes paid on these profits. Payment of taxes on "phantom profits" seriously reduces the capital available to any company with sizeable amounts of fixed plant and equipment.

The problem of inadequate capital cost recovery allowances (depreciation) is particularly severe for the American steel industry because:

- The steel industry is capital-intensive.
- The steel industry is required by Federal income tax laws to write off the original cost of its plant and equipment over an excessively long period. Prior to 1979, the guideline life for depreciating steel industry facilities was 18 years; in 1979 and subsequent years, this was reduced to 15 years. No other major industrialized nation has a longer period, and virtually all other countries permit shorter cost recovery periods.
- Steel industries abroad receive at least equal, and in some cases more favorable tax treatment relative to all manufacturing in the same country; in the United States the reverse is true.

2. *Imports at Dumping Prices*

Another significant factor contributing to the American steel industry's loss of competitive edge is the pervasive and large-scale unfair pricing of steel in our markets by foreign producers. Unfair pricing is not just selling at a low price. It means either (a) selling at a price in the U. S. market lower than an exporter's home market price, or (b) selling at a price insufficient to cover the producer's full average costs, including profit, over time. Both of these practices are known as "dumping".

Not all imports are dumped. Nevertheless, the injury to American steel producers caused by dumping and evidenced by lost sales and depressed revenues has been a major factor in preventing domestic producers from generating an adequate cash flow. This, in turn, has prevented the industry from undertaking many urgently needed investments for modernization and expansion of productive facilities.

Dumping by foreign steel producers as a means of achieving market penetration in the United States is not a recent phenomenon. Since the late 1950s foreign producers have expanded their steelmaking capacity more rapidly than their ability to market the additional steel in their home markets. This has prompted them to spur exports through dumping overseas, especially in periods of cyclically weak home market demand. As the largest and least restricted steel market in the world, the United States became the logical target for much of this excess steel, which was frequently sold at less than fair value and at prices significantly below those prevailing in the United States.

As mentioned earlier, domestic steel consumers looked to foreign steel sources as a hedge against possible domestic steel industry strikes. In recognition of that fact and its associated disruptive influences on production stability and employment, the industry and the United Steelworkers of America entered into the Experimental Negotiating Agreement (ENA) in 1973. This agreement utilizes arbitration as the means for settling unresolved contractual issues, and as such eliminates the possibility of an industry-wide strike.

In spite of this agreement the practice of dumping and the damage caused to the domestic steel industry have intensified dramatically since 1976. During the world steel shortage of 1973-74, steel imports averaged 15.6 million net tons and accounted for less than 13% of the domestic market. Following the 1975 recession, however, steel imports grew rapidly to a record 21.1 million tons in 1978, accounting for 18.1% of the domestic market.

The combination of lost sales and depressed revenues that resulted from dumping on the scale experienced since the 1973-74 boom has had a devastating impact on the American steel industry. In 1977, in particular, profits virtually disappeared, as a quarter of the industry's productive capacity was idled and most producers experienced large operating losses. The industry's inability to generate profits also required producers to make substantial cuts in investment programs for modernization and for increases in capacity to meet expected growth in demand.

The impact of dumped steel on the domestic industry was vividly demonstrated by a study completed in August, 1978, by the consulting firm of Putnam, Hayes and Bartlett, Inc., (PHB).[4] The PHB study concluded that injury to the American steel industry caused by dumping totalled some $4 billion for the years 1976 and 1977 alone.

Two particularly important points are made in the PHB study. First, the most direct test of dumping in an economic sense is price discrimination — specifically, sales to an export market at prices below home market prices.[5] The PHB analysis of Japanese home and export market pricing practices, exhaustively developed for Japanese fiscal year 1976, demonstrated that the average price of steel exports in the U. S. was at least $25 per net ton below Japanese domestic prices. This result, PHB concluded, establishes quite conclusively that Japanese producers were able to discriminate between shipments to their home market and shipments to the U. S. market, charging significantly lower prices on the latter.[6]

Secondly, this practice of Japanese price discrimination also has had a cyclical effect. The inducement for Japanese producers to dump steel in the U. S. and elsewhere (to maintain volume and thereby cover fixed costs) increases as demand in Japan declines in cyclical downturns.

The fast-growing penetration of the U. S. market by dumped foreign steel occurred because U. S. laws against unfair trade practices such as dumping have not been fully and vigorously enforced. A report on the Antidumping Act of 1921 published by the General Accounting Office in 1979 acknowledged this lack of enforcement,[7] as did President Carter at the time the Trigger Price Mechanism (TPM) was established. (The TPM was the government's response to the problem of dumping when damage to the steel industry and its employees reached the stage of national crisis towards the end of 1977.)

The TPM is a procedural device designed to facilitate enforcement of antidumping laws; it is not designed to restrict imports as such. Indeed, steel imports soared in 1978 as increased shipments from EEC and developing country producers more than offset a moderate decline in imports from Japan.

The pace of imports declined in the first half of 1979, but the problem of dumping remains. Because the TPM is based on a calculation of steel producers' costs in Japan, believed by the U. S. Treasury to be the lowest of the major steel producers, the TPM allows higher-cost (non-Japanese) exporters to sell in this market at dumping prices. The effect of these imports at less than fair value has been to deny domestic producers the full benefit of the steel market recovery that occurred in 1978 and the first half of 1979.

The American steel industry's problems with imports are not limited to those arising from dumping. Another problem is subsidization by foreign governments as discussed in Appendix A.

Clearly, the American steel industry has been seriously damaged by illegally dumped and/or subsidized imports into this market. The damage will continue until laws against such unfair trade practices are promptly and vigorously enforced (appropriate trade policies are discussed in Chapter VIII).

3. Government Regulations and Controls

a. Environmental Regulations

The costs of complying with the Clean Air Act of 1970 and the Clean Water Act of 1972, as amended, have placed a significant burden on the steel industry. By the end of 1978, the industry had invested $3.7 billion ($6 billion in 1978 dollars) for environmental control facilities. Direct operating and maintenance costs for these environmental control facilities are in excess of $550 million per year.

While costs of compliance have placed a heavy financial burden on domestic producers, foreign nations have taken a more practical approach. Instead of requiring all facilities to meet environmental standards, thus mandating large-scale retrofitting of older facilities, other nations (particularly Japan) have required the retrofitting of old plants only to meet the most flagrant violations.

b. OSHA Regulations

Many years prior to the passage of the Occupational Safety and Health Act (OSHA), the steel industry recognized the need for comprehensive formal safety and health programs, employing full-time safety and industrial health professionals. During the two decades prior to the passage of OSHA (1950-1970), disabling injury rates in the steel industry were far lower than the average of all industry. In 1950 the steel industry incurred 4.63 disabling injuries per million manhours worked, compared with 9.30 such injuries for all industry and business. Further, the disabling injury rate declined by 27% in steel during these two decades, compared with a decline of 5% for all industry and business.

During more than eight years since OSHA was enacted, there has been no significant improvement in the workplace injury rate, according to the Bureau of Labor Statistics. Moreover, the adoption of OSHA's 4,000 safety standards, with few exceptions, did not consider age of equipment, retrofit problems, or need based on injury experience. Since

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[4] Putnam, Hayes & Bartlett, Inc., **The Economic Implications of Foreign Steel Pricing Practices in the U. S. Market**, August, 1978.

[5] **Ibid.**, p. ii.

[6] **Ibid.**, p. ii.

[7] Comptroller General, General Accounting Office: **U. S. Administration of the Anti- dumping Act of 1921**, March, 1979, pp. I-IV. **Report to the Congress of the United States**.

the consensus safety and health standards were adopted en masse, there was no effort to consider risk or cost-benefit, or to implement certain standards on a priority basis with explicit goals in mind. As a result, technical compliance has often had a disruptive effect on the implementation of existing effective safety and health programs directed at the reduction of injury and illness. All of these deficiencies have resulted in a cost of compliance which, though difficult to calculate, has contributed to a worsening of the domestic steel industry's competitiveness vis-a-vis its foreign counterparts. Moreover, as discussed in Chapter XI, large amounts of capital will be required in the future to comply with known regulations.

c. Cost Impact of Government Regulations

Another problem affecting the domestic iron and steel industry is the heavy impact of government policies and regulations on steel industry costs. The Council on Wage and Price Stability (CWPS) in 1976 studied Federal regulations affecting the industry. CWPS found "a picture of an industry that could hardly move without taking into account the wishes or directives of some Federal agency."[8] CWPS further admitted that the situation is so pervasive that "Steel is an industry whose production procedures are to some extent prescribed for it by government, whose costs are substantially influenced by government, whose market share exists at the sufferance of government and whose profitability has a good deal less to do with innovation and enterprise than it does with what government decides to let it keep."[9]

The steel industry in 1976, according to the CWPS study, was subject to more than 5,600 Federal regulations (affecting actual steelmaking operations only) and had 27 Federal agencies watching over its shoulders, often with overlapping regulatory domains. Added to this is the proliferation of state and local agencies.

The costs to the taxpayers of maintaining the regulatory bureaucracies, and to industry for the actions it would not have taken in the absence of regulation, are the most visible burdens of regulatory action.

To document the most visible costs, the Business Roundtable in 1978 initiated a study of the incremental costs incurred in a sample of 48 large corporations in one year (1977) to comply with the regulatory requirements of only six Federal agencies and programs.[10] Incremental costs, defined as the direct costs of actions taken to comply with a regulation that would not have been taken otherwise, amounted to $2.6 billion for the 48 companies. The impact was heaviest — $2.3 of the $2.6 billion — on the manufacturing sector of which the steel industry is a part.

The paperwork burden reported by one steel firm for 1978 was 92,000 pages of reporting to 112 agencies of various levels of government — Federal, state, and local. Another, larger steel firm reported that in 1975 it had to apply to 379 agencies for licenses or permits, had to report to 1,245 different agencies, and had to maintain regular correspondence with 1,026 agencies. This burden affects nearly every area of company operations. The same large steel firm noted that in 1975 its financial department was obligated to report to 308 agencies, its research laboratories to 13 agencies, and its international operations to 9 different U. S. agencies.

These burdens of regulation, as CWPS pointed out, show up most dramatically in the collapse of productivity growth rates in two sections that have been most affected: in mining. . .and in primary metals.[11] The cost and productivity deterioration resulting from overregulation has thus contributed to the industry's current condition.

4. Government Interference in Market Pricing

For most of the period since World War II, selling prices for steel have been constrained in some manner by our government (while foreign nations have subsidized their steel industries). It has been politically popular to attack steel price increases and to blame them for inflation, even though steel mill products account for only about 3 percent of the BLS Producers' Price Index (the former Wholesale Price Index). A detailed discussion of the impact of price constraints on steel is contained in Chapter XII and Appendix B.

5. Cost Increases More Rapid Than Price Increases

Over the past ten years, major steel industry cost factors (purchased goods and services, and employment costs) have risen more rapidly than steel prices.[12] To a large extent this reflects the fact that, for reasons discussed in Chapter III, the industry has been limited in its ability to install new and more efficient facilities and, as a result, efficiency improvements have not been of sufficient magnitude to offset the rapid increases in per-unit costs of raw materials, energy, and labor.

Of particular concern to steel producers are energy costs, which have escalated since 1973 to a far greater extent than the prices of most of the purchased products and services. Purchased energy costs represent nearly twice as large a share of steel industry purchases as their weight in the BLS Producers' Price Index.

Steel production consumes large amounts of energy, as noted earlier, and as discussed in Chapter IX. Despite significant conservation efforts

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8 Council on Wage and Price Stability, **Catalog of Federal Regulations Affecting Iron and Steel Industry**, December, 1976, p. iv.

9 **Ibid.**, p. iv.

10 Business Roundtable, **Cost of Government Regulation Study**, March, 1979.

11 Council on Wage and Price Stability, **Prices and Costs in the United States Steel Industry**, October, 1977.

12 American Iron and Steel Institute, **Annual Statistical Report**, 1978.

by steel industries, their energy costs have risen dramatically. The cost of energy in steelmaking in 1978 was four times greater than at the start of the 1970s, and over 80 percent of this increase occurred since the oil embargo. The energy crisis and the energy-intensive nature of steel production help explain why total steelmaking costs have risen more rapidly in recent years than industrial prices generally.

Also contributing have been labor cost increases in excess of productivity improvements. Some observers contend that the steel industry has not been firm enough in resisting labor's demands, but it must be realized that increases in steelworker wages and benefits have been in line with those of comparable industries. Companies in the industry are determined, however, to exert even greater efforts to hold down future employment costs in every possible way. To a considerable extent, of course, this must be accomplished by gains in worker productivity which in turn hinge largely on the industry's ability to install more modern and efficient facilities.

In general, critics have argued that American steel companies have not made the necessary all-encompassing efforts to keep steel costs in line. While the industry agrees that any standard of performance is capable of improvements, it is difficult to see how significant gains are possible given the limited funds available for efficiency improvements. There is no doubt that far greater capital expenditures for cost improvement will be required in future years if the American steel industry is to reverse the trend towards reduced competitiveness.

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III Inadequate Capital Formation Is a Problem For the American Economy — And for the Steel Industry

. . . Savings by individuals and corporations have been restrained in recent years. This has led to insufficient spending for plant and equipment in the American economy. Such spending has also been adversely affected by the tax law limiting depreciation to historical cost and by inflation. Inadequate plant and equipment spending has contributed to lagging productivity . . .double-digit inflation . . . inadequate job creation . . . and lagging economic growth. Insufficient capital formation in the economy has been particularly harmful to the steel industry because two-thirds of steel shipments go to capital goods industries. Capital investment by the American steel industry has declined sharply in recent years. The results have been aging facilities, a decline in the rate of improvement in output per manhour, and reduced cost competitiveness.

A. Capital Formation Is a Problem For the American Economy

Too small a share of the nation's income is saved for investment in tools of production because too much is spent for government and private consumption. For example, total savings in the U. S. economy during 1975-78 averaged less than 4% of Gross National Product (GNP). Government spending however, averaged over 21% of GNP — more than five times the level of savings.

In every country, regardless of its economic system, investment in new and better plant and equipment has been an extremely important factor in increasing productivity and raising the standard of living. But growth in such investment has recently been very slow in this country.

In any private enterprise economy, there are two sources of savings: individuals and businesses. During recent years, both of these sources in the U. S. have been severely affected by inflation as well as taxation. Individual savings have been restrained in a number of ways: as inflation boosts the incomes of individual taxpayers higher in monetary terms, progressive taxes siphon off an ever-increasing share of those incomes. Thus, *real* incomes decline. Therefore, in order to maintain the same standard of living, individuals have to reduce their savings. In addition, since capital gains are not deflated for changes in the price level, capital gains taxation actually taxes not only income but *capital*.

Corporate savings (i.e., reinvested profits) have likewise been very low in recent years. This country's tax laws permit a business to charge off as an expense only the original (or "historical") cost of facilities. Therefore, when the purchasing power of the dollar shrinks, recoveries of original funds spent many years earlier are nowhere near enough to replace these facilities. And, when charges against earnings for assets consumed are less than their true current value, the difference appears as a profit — even worse, it is taxed as though it were profit.

After adjusting profits for current-dollar capital consumption allowances and current values of inventories — and after payments of dividends — profits reinvested in the tools of production by nonfinancial corporations have averaged only $10 billion per year during the 1970s as compared with $60 billion of reported profits, as shown in Chart III-1.

The declining share of profits in the nation's economy in recent years is in sharp contrast to the rising share for payments to and for employees, as shown on Chart III-2. The significance of Chart III-2 is that whereas virtually all reinvested profits go into plant and equipment investment, only a tiny fraction of employee compensation is ultimately saved and invested.

B. Capital Investment Is Inadequate For Several Reasons

Inadequate savings lead to inadequate spending for plant and equipment. As shown in Chart III-3, spending for new tools of production during the past twenty years has represented a smaller share of GNP in this country than in any other major industrialized nation.

In addition to the lack of savings, there are other important factors that bear adversely on the level of spending for the job-creating tools of production. For example, limiting depreciation to historical cost not only overstates business income and the taxes paid on that income, but it also reduces the incen-

CHART III-1

Profits Adjusted for Inflation Have Been Very Small

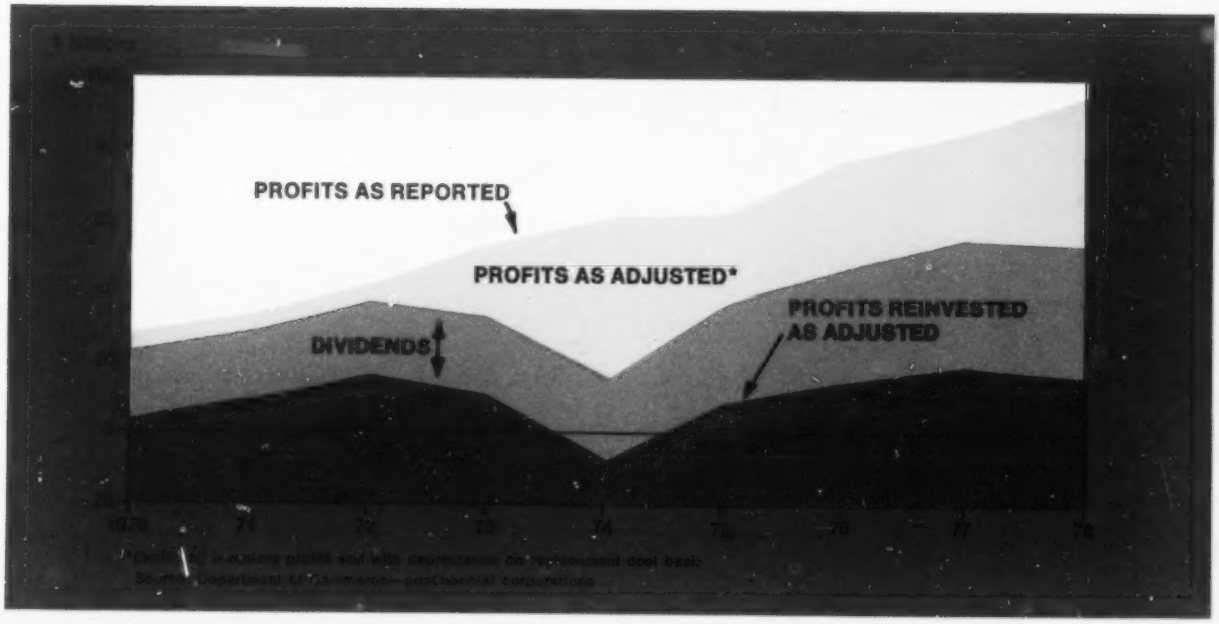

CHART III-2

Corporate Profits Relative to Employee Compensation Have Declined Substantially 1950-1978

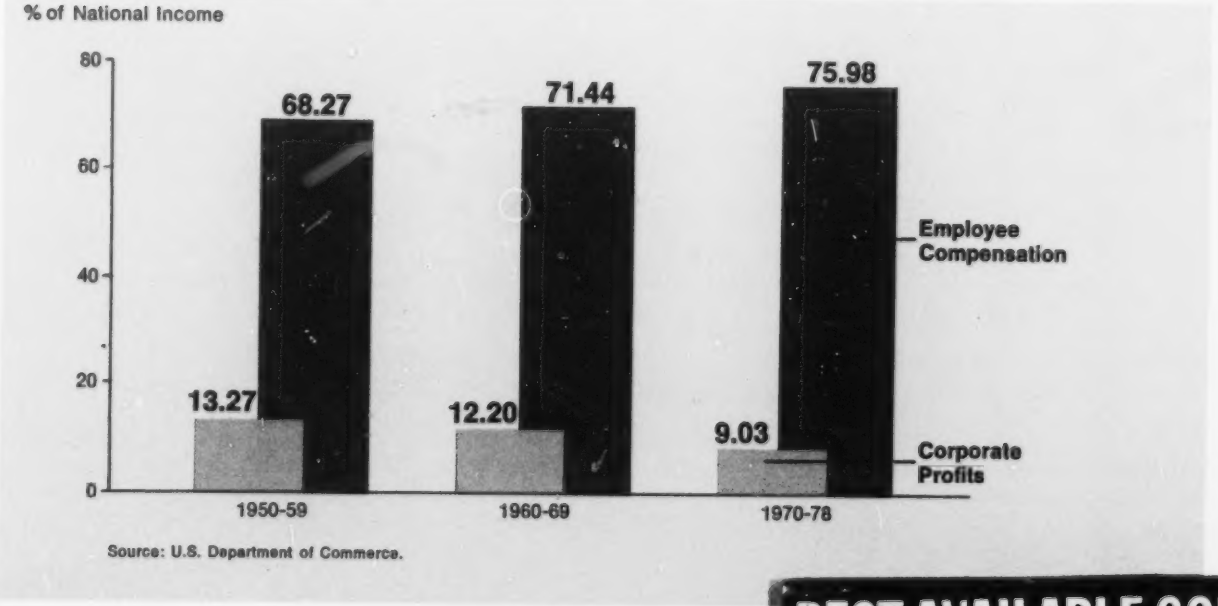

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CHART III-3

USA Is "Dead Last" in Spending for New Tools 1960-1978

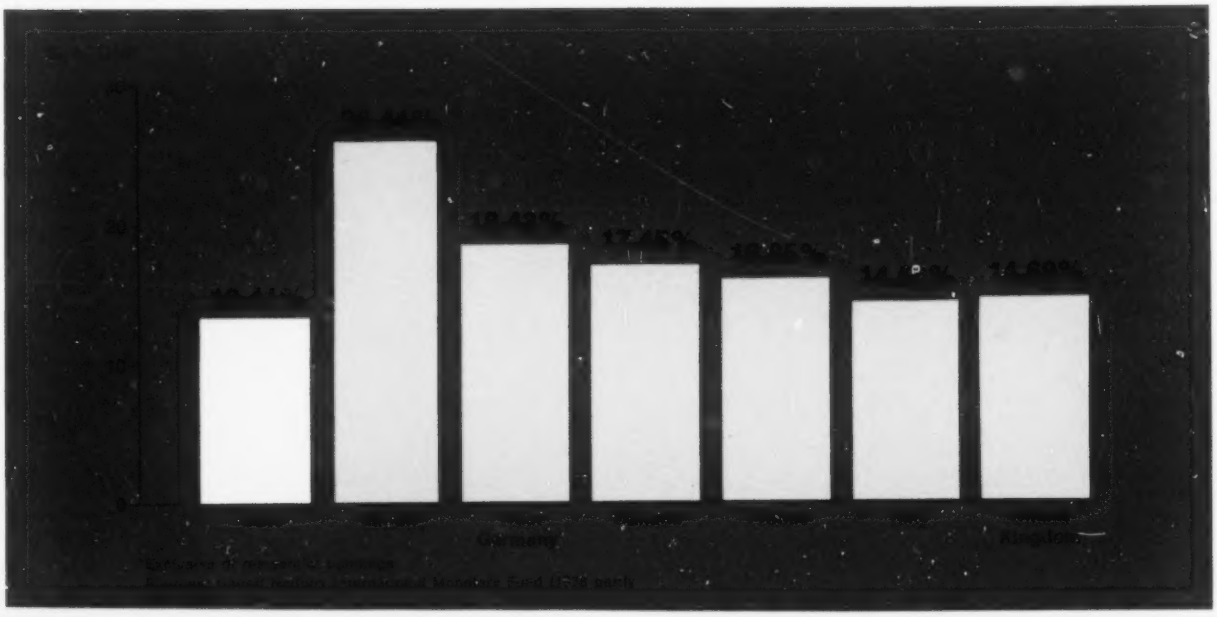
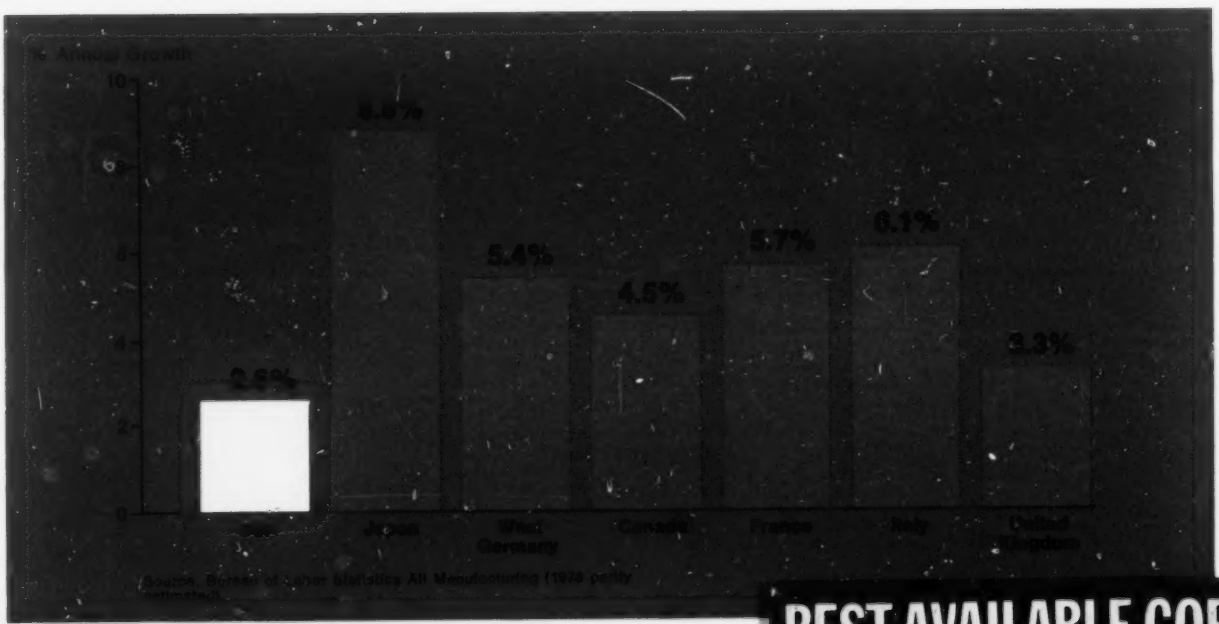


CHART III-4

USA Is "Dead Last" in Growth of Output Per Hour 1960-1978



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tive to invest in plant and equipment. Why invest money in something that is going to be heavily taxed?

Inflation is another factor that severely dampens spending for tools of production. Inflation raises the prospective costs of new facilities each year, making them less attractive financially. And, interest rates that reflect inflation raise the cost of financing such facilities.

C. America Is Hurt by Inadequate Spending for Plant and Equipment

1. Inadequate Productivity

Improvements in output per manhour, often used as a rough approximation for productivity, have lagged quite badly in this country compared with other industrialized nations, as shown in Chart III-4.

While many factors contribute to productivity improvement, the most important is investment in new, modern, more efficient tools of production. The slowdown in the rate of improvement in output per manhour has gone hand-in-hand with the slowdown in the rate of spending, in constant dollars, for new and better tools of production; both have declined substantially since the 1960s, as shown in Chart III-5.

The method by which productivity improvements can be brought about was recently spotlighted by the Council of Economic Advisers in its Annual Report: "Only by devoting a significant share of current production to replace, modernize, and expand the capital stock can we hope to maintain adequate growth in productivity."[1]

When employment cost increases are not covered by corresponding increases in output per hour, the inevitable result is an increase in unit labor costs. And, since labor costs constitute some three-quarters of total costs in the American economy, unit labor costs increases are inevitably reflected in price increases.

2. Inadequate Job Creation

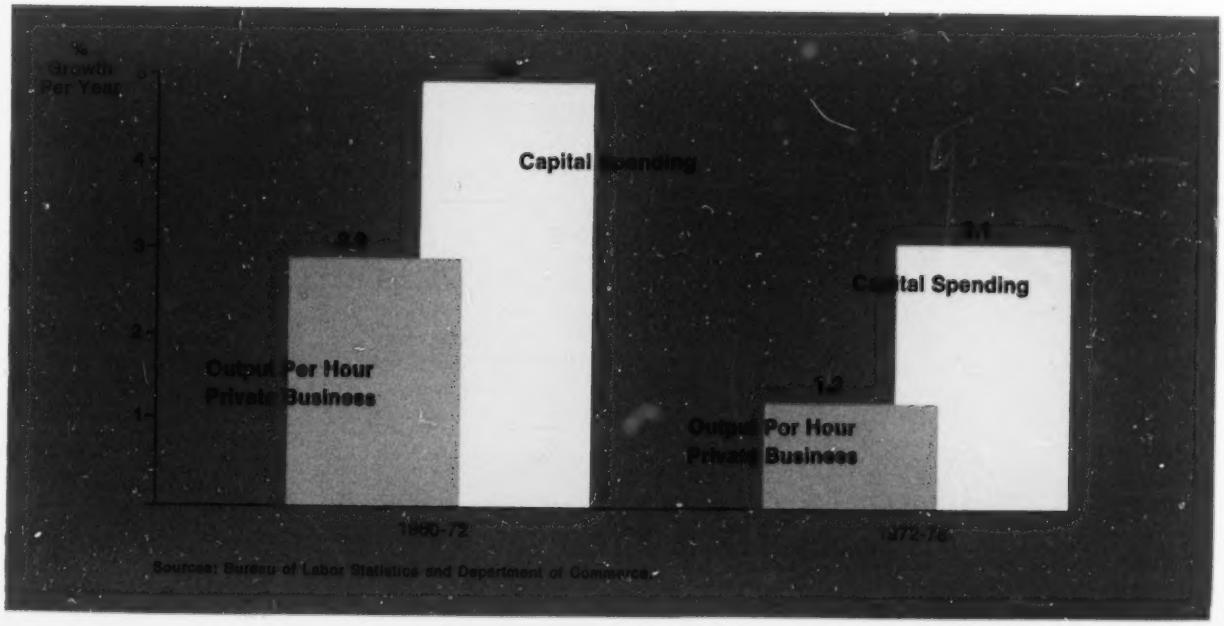
From the record during the past twenty years, it is apparent that spending for new plant and equipment is directly and closely related to the preservation of existing jobs and to the creation of new jobs, as shown in Chart III-6.

During those years of healthy increases in spending for tools of production, U. S. employment also rose substantially. This is only logical, since it takes many people to design, build, transport, install, break in, and operate new plant and equip-

[1] Council of Economic Advisers, **Economic Report of the President**, January 1979, p. 124.

CHART III-5

Slowdown in Output Per Hour Has Gone Hand-In-Hand with Slowdown in Spending For New and Better Tools of Production



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ment. Conversely, when spending for new tools of production lags, employment also lags.

3. Economic Growth

The close relationship between spending on new and better tools of production and job creation also exists between such spending and the nation's economic growth, as shown in Chart III-7.

D. Inadequate Capital Investment Is A Serious Problem for the American Steel Industry

Some two-thirds of steel shipments go directly or indirectly to capital goods industries. When spending on capital goods is high, the demand for steel is high; conversely, when capital spending lags, so does the demand for steel.

During the period 1969 to 1978, capital expenditures by the steel industry averaged $2.2 billion per year. In the preceding ten years, 1959 to 1968, capital expenditures averaged $1.5 billion per year. While capital expenditures increased in current dollars during the most recent ten-year period, capital expenditures in constant dollars declined. In 1978 dollars, total capital expenditures by the American Steel Industry averaged $2.9 billion per year over the past decade, as compared with $3.2 billion per year in the preceding decade. (See Table III-1.)

The above numbers, which indicate a moderate decline in capital expenditures in real terms, do not fully illustrate the magnitude of the problem facing American steel producers. Excluding non-steel and expenditures for environmental purposes, capital expenditures fell from $2.6 billion (1978 $) for the period 1959-1968, to $2.1 billion for the most recent 10 years, as shown in Table III-1. Capital expenditures per annual ton of shipments declined from $33 (1978 $) in the 1960s to $25 in the 1970s.

TABLE III-1

The American Steel Industry Has Made Inadequate Capital Investments During the Last 20 Years

DOMESTIC STEEL INDUSTRY'S AVERAGE ANNUAL CAPITAL EXPENDITURES

	Historical Dollars Total (Billions)	1978 DOLLARS Total (Billions)	Excluding Non-Steel and Environmental (Billions)	Per Annual Net Ton of Shipments $/N.T.
1959-1968	$1.5	$3.2	$2.6	$33
1969-1978	2.2	2.9	2.1	25

Source: American Iron and Steel Institute

Based on 1978 replacement capital costs of $1,000 per net ton of annual shipments (see Chapter V), this means that during the 1960s, the facility replacement rate was 3.3% per year[2] — a replacement cycle of 30 years. During the 1970s, the facility replacement rate was 2.5% — a replacement cycle of 40 years. As shown in Table III-2 and discussed in Chapter V replacement cycles of 25 years will be required in the next decade.

TABLE III-2

As a Result of Inadequate Capital Investment The Replacement Cycle of Steel Facilities Has Been Too Low

	Annual Capital Expenditures (78$) Per Ton of Shipments	Capital Cost (78$) Per Ton Annual Shipment	Replacement Cycle	Replacement Rate Per Year
1959-1968	$33	$1,000	30 Yrs.	3.3%
1969-1978	25	1,000	40	2.5
Average	29	1,000	35	2.9
1979-1988 (Needed)	40	1,000	25	4.0

Source: American Iron and Steel Institute

The very low replacement rates for steel facilities over the past 20 years have left the American steel industry with a current average age of equipment of 17.5 years (Table III-3). However, given the even lower replacement rates of the 1970s, the average age of plant and equipment is increasing and will probably continue to do so unless replacement rates improve substantially above the 1970s level.

TABLE III-3

Many Steel Facilities Are Now Quite Old Because Capital Expenditures Have Been Inadequate

	Average Age of Capacity (Years)*	Age Distribution % 30 +	25 +	20 +
Coke Ovens	17.3	14.2%	25.6%	46.9%
Open Hearth Furnaces	33.2	43.0	78.5	100.0
Basic Oxygen Furnaces	11.0	0.0	0.0	2.3
Electric Furnaces	14.3	6.1	13.8	25.3
Plate Mills	25.6	40.8	45.1	53.6
Wire Rod Mills	13.7	12.6	17.3	17.9
Hot Strip Mills	19.0	11.6	16.1	31.5
Cold Strip Mills	21.2	14.7	29.2	54.1
Galvanizing Lines	18.8	4.4	8.9	40.1
Aggregate	17.5	12.5	20.4	33.3

*As of January 1, 1979.

Sources: **The World Steel Industry Data Handbook** Vol. 1, the U. S. and American Iron and Steel Institute

Table III-3 also shows that 12.5% of equipment capacity is over 30 years of age, 20.4% over 25 years of age, and 33.3% over 20 years. Assuming 25 years is a desirable facility replacement cycle, approximately 20% of the industry's facilities are due for

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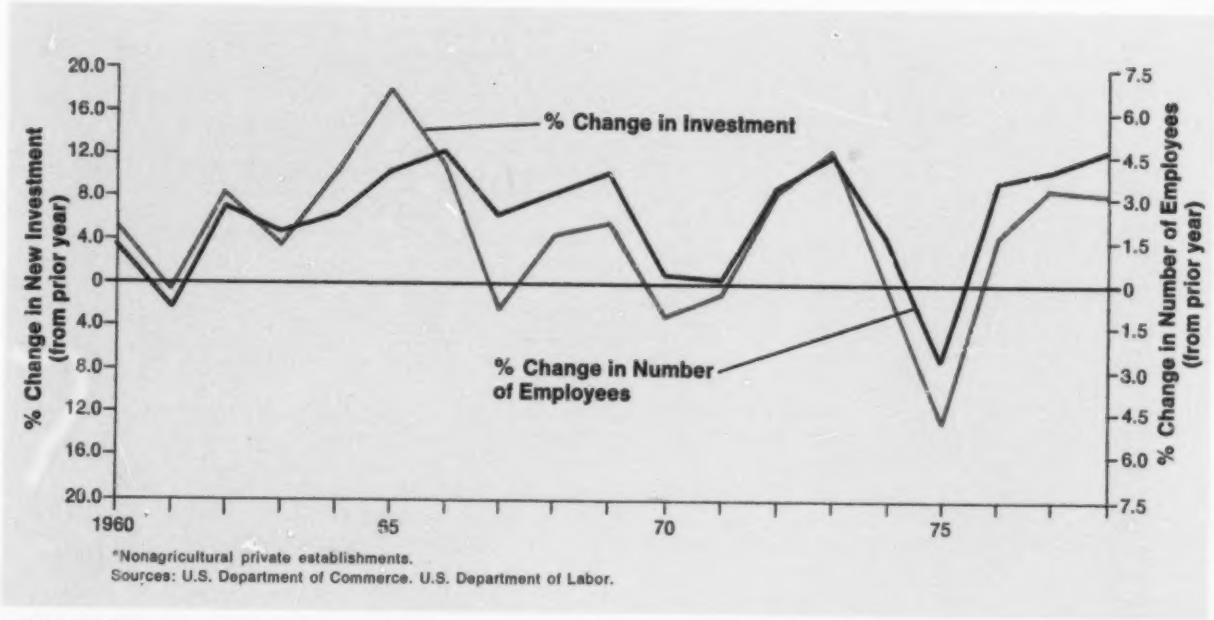
2 Real productive capital expenditure of $33 per net ton of shipments divided by 1978 $ replacement costs of $1,000 per net ton of annual shipments as shown in Chapter V.

CHART III-6

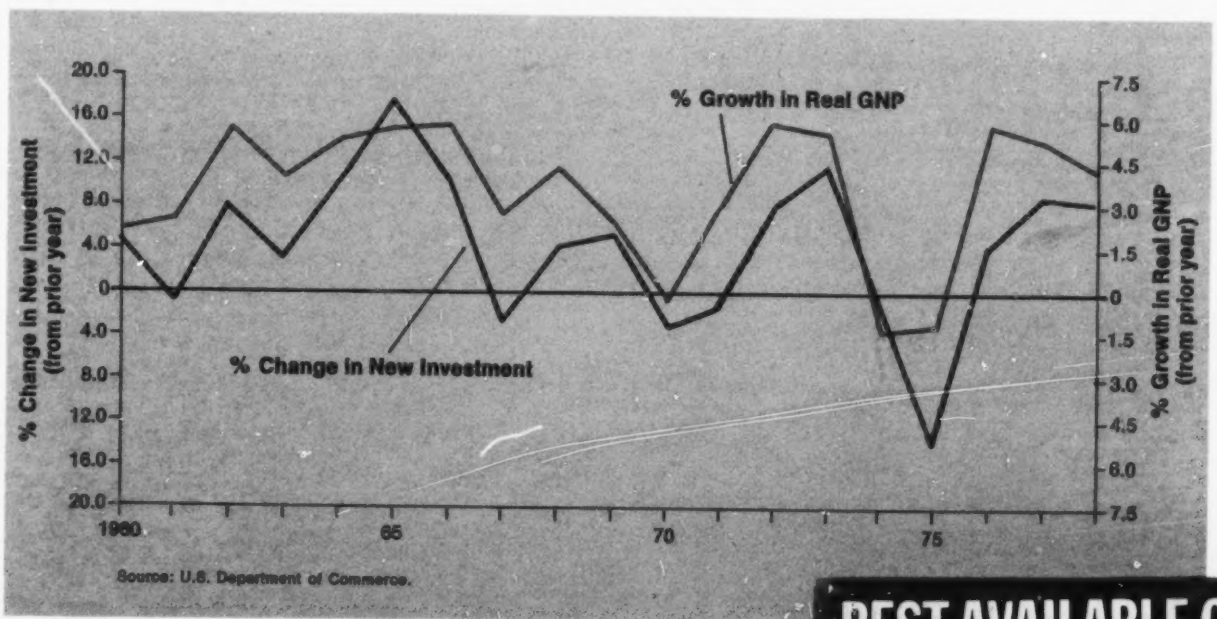
Growth In Investment For Tools of Production Means Growth in Jobs



*Nonagricultural private establishments.
Sources: U.S. Department of Commerce. U.S. Department of Labor.

CHART III-7

Growth in Investment for Tools of Production Means Economic Growth



Source: U.S. Department of Commerce.

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replacement and thus economically vulnerable. Estimates by Arthur D. Little, Inc.[3] suggest that 25% of the American steel industry's plants would be marginally profitable even at a 90% capacity utilization rate. Estimates by McGraw Hill support the Arthur D. Little, Inc., study, and also indicate that steel is not the only American Industry in the grip of an "aging" crisis.[4]

E. Inadequate Capital Spending Has Reduced Steel's Competitive Edge

What are the consequences of the steel industry's inadequate rate of spending? New techniques of production necessary to improve energy efficiency, material usage, labor productivity, environmental quality, cost competitiveness, and rates of return are all embodied in new capital equipment. Unless such new equipment is installed, little improvement in most of these areas is possible. As discussed in Chapter II, the American steel industry has fallen behind the Japanese in energy efficiency, has been losing ground in labor productivity, and is having difficulty remaining cost-competitive. All of these problems are in large measure a result of inadequate levels of capital expenditures by the American steel industry which, in turn, relate to the capital formation problems facing all American industry.

The decline in real capital expenditures (and thus replacement rates) in the 1970s helps explain why labor productivity in the American steel industry grew at only 2 percent per year over the past decade as compared to 3.6 percent per year over the preceding decade. A further consequence of the decline in real capital expenditures in the last decade has been no increase in production capability in the American steel industry since 1969 and a decline in production capability since 1976.

The American steel industry needs to make substantial capital expenditures during the next decade in order to remain cost-competitive. For the domestic industry to have the resources for substantially higher capital expenditures, additional profitability and improved capital cost recovery allowances are sorely needed.

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[3] Arthur D. Little, Inc., Special study for American Iron and Steel Institute — **Limited Life Facility and Plant Vulnerability**, August, 1979.

[4] McGraw Hill, **World Steel Industry Data Handbook**: Volume I, the United States, 1978, page 7.

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IV World Steel Demand Will Increase in the 1980s

. . . If world steel demand—supported by a pickup in capital expenditures—grows as projected, and if world steel capacity growth is restrained by the events of recent years, there will be a much closer balance between world steel supply and demand in the decade of the 80s than there was in the 70s. Unless U.S. capacity increases as world capacity utilization rises above 85 - 90%, the U.S. economy will be seriously affected by: steel shortages; upward pressure on prices; and a growing steel trade deficit.

In attempting to arrive at the overall level of steel demand and supply in the 1980s, several factors must be considered:

- The level of general economic growth.
- The level of steel consumption.
- The trend and pattern of world steel trade.
- The level of world steel production.
- The availability of future steel capacity.
- The balance between world steel demand and supply.
- The policy implications of a closer balance between demand and supply.

A. Historic Economic Growth: 1950-1975

Worldwide growth of population and Gross National Product have increased global steel consumption. However, there are significant differences in the rates of growth in population, GNP, and steel consumption in various countries of the world.

TABLE IV-1

Growth Rates Have Varied Widely Among Regions
(Annual Rates of Growth)
Avg. 1948/52 — Avg. 1973/77

	GNP	Population	GNP/ Pop.	Steel Consumption	"Steel Intensity" (Steel Consumption/GNP)
USA	3.4%	1.4%	2.0%	2.0%	—1.4%
Japan	8.9	1.1	7.8	12.3	3.4
EEC	4.4	0.7	3.7	4.3	—0.1
Rest of Free World	5.5	2.3	3.2	7.1	1.6
Total Free World	4.6	2.0	2.6	4.6	—
Red Bloc	5.5	1.5	4.0	7.7	2.2
Total World	4.8%	1.9%	2.9%	5.4%	0.6%

Sources: World Bank, United Nations, International Iron and Steel Institute.

In the early 1970s, the International Iron and Steel Institute (IISI) prepared an intensive analysis of the relationships between world population, GNP (constant $) and steel consumption for 16 individual countries/regions.[1] These results were used to forecast future steel consumption for these regions. The study concluded that steel intensity (consumption per dollar of GNP) rises markedly with increases in per capita income up to a limit (or "point of maturity") beyond which subsequent increases in per capita income produce little additional steel consumption per dollar of GNP.

The historical rates of growth from 1950 (average 1948/52) to 1975 (average 1973/77) for the U.S.A., Japan, European Economic Community, the Rest of The Free World, and the Red Bloc are listed in Table IV-1 and discussed below.

A brief discussion of growth rates by regions follows:

- *USA* — During the period 1950-1975, GNP grew at an annual rate of 3.4%. Population rose, on average, 1.4% per year, with the result that GNP per capita rose 2.0% per year. Over the same period, steel consumption grew 2.0% per year and "steel intensity" (that is, steel consumption/ GNP) decreased 1.4% per year.

  The declining rate of growth for steel intensity vs. the positive rate of growth in per capita GNP is not surprising. The U. S. is representative of an industrialized economy in an advanced stage of economic development.

- *Japan* — This is another example of a mature industrialized economy, though exhibiting much higher rates of growth than the U.S.A. Over the period 1950-1975, GNP rose 8.9% per year, population went up only 1.1% per year and steel consumption grew at a very healthy 12.3% per year. As a result, the rate of change of steel intensity was 3.4% and the rate for GNP per capita was 7.8%. Recently, Japan has also passed the peak of the steel intensity curve and future increases in GNP/population will not produce equivalent growth in steel consumption/GNP.

- *European Economic Community* — The annual rate of growth for GNP from 1950 to 1975 averaged 4.4%. Population grew only .7%, with the result that GNP per capita rose 3.7%. Over the same period, steel consumption's rate of

[1] International Iron and Steel Institute, **Projection '85,** 1972.

TABLE IV-2

World Steel Production, Trade, and Consumption Have Grown Substantially Since World War II (Million Net Tons of Raw Steel Equivalent)

	Avg. 1948-1952				Avg. 1973-1977			
	Production	Imports	Exports	Consumption	Production	Imports	Exports	Consumption
USA	92.3	1.3	4.8	88.8	133.3	18.0	4.6	146.7
Japan	5.1	—	0.9	4.2	120.9	0.2	44.6	76.5
EEC	54.0	0.9	11.2	43.7	152.4	11.5	40.0	123.9
Rest of Free World	13.1	15.2	0.6	27.7	101.8	67.6	15.6	153.8
Total Free World	164.5	17.4	17.5	164.4	508.4	97.3	104.8	500.9
Red Bloc	38.7	1.6	1.5	38.8	242.0	28.7	21.2	249.5
Total World	203.2	19.0	19.0	203.2	750.4	126.0	126.0	750.4

Sources: International Iron and Steel Institute, United Nations.

growth was only 4.3%. This meant that steel intensity actually declined 0.1% per year. The fact that per capita GNP grew while steel intensity dropped is typical of an industrialized economy in an advanced stage of economic growth. The peak of the steel intensity curve was passed very early in the period under discussion.

- *Rest of Free World* — This group is comprised to a considerable extent of countries still moving up toward the peak of the steel intensity curve. Taken together, GNP rose 5.5% per year from 1950 to 1975, population expanded at 2.3% per year, and steel consumption has grown 7.1% per year. As a result, the rate of change of steel intensity increased at a slower rate than GNP per capita (1.6% vs. 3.2%). This reflects more the traditional path for developing nations that are beginning to build their industrial base.

- *Total Free World* — Combining the mature industrialized economies — U.S.A., Japan, and the European Economic Community — with the developing countries' record, results in a counterbalancing of diverse trends. During the period 1950 to 1975, combined GNP rose 4.6%, population increased 2.0% and steel consumption rose 4.6%. The rate of change of steel intensity exhibited no increase, while GNP per capita increased at a 2.6% rate.

- *Red Bloc* — The rate of change of steel intensity increased at a slower rate than that for GNP per capita (2.2% vs. 4.0%). This group includes the USSR, East Europe, China, and North Korea. It is evident that the influence of the industrialized countries in Eastern Europe overshadows the China/North Korea region, which has not yet arrived at the peak of the steel intensity curve.

- *Total World* — The results for total world also reflect the overshadowing impact of the industrialized nations. The rate of change of steel intensity is much less than that for GNP per capita (0.6% vs. 2.9%).

B. Production, Trade, and Consumption: 1950-1975

Table IV-2 outlines the pattern of production, trade, and consumption for the same areas displayed in Table IV-1.

During the five-year period centering on 1950, the United States was the leading consumer of steel and was more than self-sufficient. Japan had only a small, war-ravaged industry, while Europe was well into the process of rebuilding—its output was more than ten times that of Japan. The Rest of the Free World supplied less than half of its own needs, and the Red Bloc made little effort to participate in world trade.

By the mid-70s, many important changes had occurred. The Red Bloc (primarily the USSR) had become the world's largest steel producer and consumer. The U. S. home market expanded by 65%, but almost a third of the increase was supplied by steel imports. Japan's growth in both production and consumption was phenomenal, but it continued to import very little. The EEC tripled its output to satisfy an expanding domestic market and a growing international market, while managing to keep its imports well below exports. The Rest of the Free World remained steel-deficient, although rapidly growing steel industries in many of these nations were supplying an increasing share of domestic consumption. The Red Bloc experienced phenomenal growth with a 6-1/2-fold increase in consumption and also increased its volume of international steel trade, although remaining a relatively minor factor in total world steel trade.

TABLE IV-3

Shares of World Steel Production, Trade, and Consumption Have Changed Considerably Over Past Three Decades (% of Total)

	Avg. 1948-1952				Avg. 1973-1977			
	Production	Imports	Exports	Consumption	Production	Imports	Exports	Consumption
USA	45.4%	6.9%	25.4%	43.7%	17.8%	14.3%	3.7%	19.6%
Japan	2.5	—	4.8	2.1	16.1	0.2	35.4	10.2
EEC	26.6	4.7	59.3	21.5	20.3	9.1	31.7	16.5
Rest of Free World	6.5	79.9	2.6	13.6	13.6	53.6	12.4	20.5
Total Free World	81.0	91.5	92.1	80.9	67.8	77.2	83.2	66.8
Red Bloc	19.0	8.5	7.9	19.1	32.2	22.8	16.8	33.2
Total World	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Sources: International Iron and Steel Institute; United Nations.

Based on the data set forth earlier, Table IV-3 shows the percentage share of world steel production, imports, exports, and consumption for each region:

A brief discussion of shares of world steel production, trade and consumption follows:

- *USA* — The U.S.A. share of world steel production fell from 45% in the 1948-1952 period to only 18% in the mid-70s. This was caused by a major decline in share of consumption and also by the shift in the export/import pattern mentioned previously. During the earlier period, the U. S. accounted for 25% of total world steel exports vs. less than 5% in recent years. At the same time, the U. S. share of total imports doubled, from 7% to over 14%.

- *Japan* — In the 1948-52 period, Japan produced less than 3% of the world steel, but by 1975 this percentage had grown to over 16%. The Japanese domestic market underwent significant growth also, but this is a protected market almost immune to penetration. The other major contributing factor to the rapid growth in output was the role of exports. From a share of less than 5% in 1950, Japanese exports have grown to the point where Japan in the mid-70's was the leading world steel exporter, shipping over 35% of total exports.

- *European Economic Community* — The Community's share of production has declined over this period from 27% to 20%, due to adverse developments in imports, exports, and consumption. The import share has doubled, the share of exports has fallen from some 60% to 30%, and the share of consumption is down from 22% to less than 17%.

- *Rest of Free World* — The increased share of production has resulted from the rapid growth of developing industries, particularly in Latin America, Spain, South Africa and Canada. As capacity expanded these nations became less reliant on imports and increasingly able to export. The main regions responsible for the growth and consumption have been: Other Western Europe; Latin America and other Asia.

- *Red Bloc* — The Red Bloc countries produce and consume about one-third of total world steel. Their share of trade has more than doubled since 1950, although the major portion is limited to USSR—Eastern Europe and Eastern Europe—Western Europe inter-shipments.

Table IV-4 presents the relationships of imports to consumption (showing percentage penetration of a country's home market by foreign steel) and of exports to production (reflecting the degree to which a producing country relies on exports to support its production level).

TABLE IV-4

World Steel Trade Has Varied Widely Among Regions

	Avg. 1948-1952		Avg. 1973-1977	
	Imports/ Consumption	Exports/ Production	Imports/ Consumption	Exports/ Production
USA	1.5%	5.2%	12.3%	3.5%
Japan	0.4	17.6	0.2	36.9
EEC	2.1	20.7	9.3	26.3
Rest of Free World	54.9	4.6	43.9	15.3
Total Free World	10.6	10.6	19.4	20.6
Red Bloc	4.1	3.9	11.5	8.8
Total World	9.4%	9.4%	16.8%	16.8%

Sources: International Iron and Steel Institute; United Nations.

From 1948-1952 to 1973-1977, the shift of imports into the U. S. is striking. In the cases of Japan and the EEC, the increased ratios of exports to production reflected the increased dependence of these nations on exports to support their steel industries. The Rest of the Free World has remained largely

reliant on imports, although the dependence has lessened. For the Total World, the percentage of steel moving internationally among countries nearly doubled during the indicated periods.

Several factors have contributed to the massive increase in steel imports into the United States. Several foreign currencies, the yen in particular, were undervalued in comparison with the dollar. Some governments granted subsidies to their steel producers, thus supporting efforts to engage in dumping in the U. S. market. Exports to the U. S. by European and Japanese steel producers were at prices significantly lower than market prices for comparable products in Europe and Japan. Furthermore, it has been well documented that these exports from abroad were priced below full costs of production in the producing countries, including reasonable provision for profit, with foreign governments in some countries underwriting operating losses.[2] The effect of such dumping over the period was to encourage the maintenance or expansion of capacity by foreign producers, while discouraging investment by U. S. producers that bore the brunt of export thrusts from Europe and Japan.

C. Estimated World Raw Steel Capacity

There are no official published measures of world steel capacity, by country or region. Several authoritative estimates are available, however. Included in the following table are estimates derived by utilizing the IISI approach for calculating steel capacity, and those made by steel analysts Peter Marcus and Father William Hogan.

The IISI methodology utilizes a country's peak production (1973-1974 for most industrialized, steel-producing countries) as a basis for its capacity estimate, arriving at current and projected estimates by modifying the base number to reflect announced or otherwise known capacity changes, both additions and/or reductions.

The Marcus estimates represent his summary of present and future capacities by country, based on existing, announced, and planned installations, and represent gross capacity. Marcus also estimates effective capacity, based on his judgments of the probable "capacity coefficients" to apply to the gross capacity figures. These figures (contained in Core Report GX but not shown in Table IV-5), indicate actual Free World effective capacity that is some 100 million tons below the gross figure shown in Table IV-5. Father William Hogan's estimates represent his judgments as to total steel capacity actually in place or being installed in the world today. The regional breakdowns of Father Hogan's world total depicted in Table IV-5 were estimated by AISI.

TABLE IV-5

World Raw Steel Capacity Was Approximately 925 Million Net Tons In 1979

	Million Net Tons		
	IISI Methodology	Marcus	Hogan
USA	168	159	155
Japan	146	167	155/160
EEC	191	223	155/160
Rest of Free World	140	170	185/190
Total Free World	645	719	650/665
Red Bloc (Est. Production)	280		275/280
Total World	925		925/945

Sources: International Iron and Steel Institute; Peter Marcus, World Steel Dynamics "Core Report GX"; Hogan, William T., Center Lines, May, 1979.

[2] Putnam, Hayes & Bartlett, Inc., **The Economic Implications of Foreign Steel Pricing Practices in the U. S. Market,** August, 1978.

D. Prospective Growth: 1975-1990

Table IV-6 summarizes the GNP and population growth assumptions that were used to forecast future levels of steel consumption for the period 1975 to 1990. Three levels of economic or GNP growth were selected: a best or control level; highest reasonable or high; and a lowest reasonable or low. The rates of growth for GNP are in every case less than those experienced during the period 1950 to 1975. They reflect an expectation of slowing economic growth in the years ahead.

TABLE IV-6

Annual Rates of Possible Growth Through 1990 Vary Widely

		GNP		
	Population	Highest Reasonable	Best	Lowest Reasonable
USA	0.9%	3.3%	2.5%	1.6%
Japan	0.7	5.0	3.5	1.7
EEC	0.2	3.7	2.5	1.4
Rest of Free World	2.5	5.1	3.9	2.5
Total Free World	2.1	4.1	3.0	1.9
Red Bloc	1.5	5.4	4.0	2.4
Total World	1.9%	4.4%	3.3%	2.0%

Source: Based on estimates made by various American Iron and Steel Institute member companies.

Table IV-7 outlines the projections to 1990 of the 1973-77 "ratios" (percentages) from Table IV-4.

TABLE IV-7

World Steel Trade Will Continue To Vary Widely Among Nations

	Avg. 1973-77		1990	
	Imports/ Consumption	Exports/ Production	Imports/ Consumption	Exports/ Production
USA	12.3%	3.5%	15%	3%
Japan	0.2	36.9	1	35
EEC	9.3	26.3	11	25
Rest of Free World	43.9	15.3	36	22
Total Free World	19.4	20.6	21	21
Red Bloc	11.5	8.8	10	9
Total World	16.8%	16.8%	17%	17%

Source: Based on estimates made by various American Iron and Steel Institute member companies.

TABLE IV-8

World Production, Trade, and Consumption of Steel Will Grow Steadily Through 1990 (Million Net Tons of Raw Steel Equivalent)*

	1980				1985				1990			
	Production	Imports	Exports	Consumption	Production	Imports	Exports	Consumption	Production	Imports	Exports	Consumption
USA	144	24	4	164	150	25	4	171	157	27	5	179
Japan	123	1	46	76	138	1	50	89	153	1	53	101
EEC	165	14	46	133	174	16	47	143	181	17	45	153
Rest of Free World	147	79	26	200	195	95	40	250	247	108	55	300
Total Free World	579	118	122	575	657	137	141	653	738	153	158	733
Red Bloc	296	30	26	300	346	35	31	350	395	40	35	400
Total World	875	148	148	875	1,003	172	172	1,003	1,133	193	193	1,133

* U.S.A. production projections based on finished product converted to raw steel equivalent at yields of 73%, 75% and 77% for 1980, 1985 and 1990, respectively. All other countries projections calculated on a raw steel basis.

Source: Based on estimates made by various American Iron and Steel Institute member companies.

For the United States, it is projected that with public policies which enable the aggressive revitalization of the American steel industry (see Scenario I in Chapter V) there will be no growth in exports' share of production and that imports will not rise above 15% of consumption.[3] In Japan, imports will continue to remain under strict control and be nominal, while exports' share of production will likely decline modestly because of the growing self-sufficiency of the steel industries of developing countries. A moderate decrease in the exports/production ratio is also forecast for the EEC, likewise due to other countries' increased capacity, while the import ratio is expected to increase slightly to about 11%. For the Rest of the Free World, there will be a marked increase in exports' share of production and a large decrease in imports' share of consumption, as more and more steel capacity is installed. The Red Bloc nations are expected to continue to supply most of their own needs.

Based on an assessment of population and GNP growth in each country (Table IV-6), historical development of steel intensity in each region in the period 1950-1975, independent projections prepared by knowledgeable analysts of these regions, and the cost and availability of energy, a "best" estimate (between the highest reasonable and lowest reasonable projections) of the trend of consumption for 1980, 1985 and 1990, is set forth in Table IV-8. This is then translated into an outlook for production, utilizing the estimated trade flows from Table IV-7.

The assumptions with respect to major geographic sections are as follows:

- *U.S.A.* — The U.S.A. share of world consumption and production is expected to continue to diminish. If imports remain at 15% of apparent consumption, the U.S.A. share of world steel imports will remain fairly constant.
- *Japan* — It seems likely that Japan will remain the largest individual steel-exporting nation. Japan is expected to continue its present share of production and consumption.
- *European Economic Community* — Over the next decade, it appears that the EEC will decline in share of production, exports, and consumption, as it is pressed on all sides by competition from more efficient facilities and former customers less reliant on its exports
- *Rest of Free World* — Developing nations will undoubtedly achieve significant increases in share of world steel production, exports, and consumption.
- *Red Bloc* — It should generally maintain its share of world trade.

As noted in Chapters V and VI, attainment of the production estimates shown for the U. S. will require a level of capital expenditures and cash flow substantially above recent levels. If recommended government policy changes are not forthcoming, production in the U. S. may not reach the level shown in Table IV-8, and the trade balance will differ substantially and disastrously from that shown.

E. Free World Supply/Demand Balance

In 1979, Free World steel capacity as estimated by IISI was 645 million net tons. In order to support steel consumption of 653 million net tons by 1985 and 733 million net tons by 1990 (see Table IV-8), it will be necessary for Free World steel capacity to be increased 170 million net tons by 1990 to 815 million net tons. At a 90% operating rate, this capacity level of 815 million net tons would support the projected 733 million net tons of consumption.

[3] Without enabling government policies totally different results for domestic production and trade could occur as developed in Chapter V under Scenario II.

As shown in Chart IV-1 below, Free World steel industries currently are not installing capacity at a sufficient rate to satisfy these requirements. Based on Father William Hogan's estimate of Free World raw steel capacity for 1985[4] and an 85—90% operating rate, shortages may well occur in the early 1980s.

F. The U. S. Economy and Steel Supply/Demand Balance

Basic to the projected steel demand discussed below is a relatively conservative economic framework for the 1980s. Real GNP is expected to grow somewhat more slowly than it has during the post-World War II era, at around 2.5% annually. However, increased attention will be directed toward upgrading the manufacturing base in the United States. It is anticipated that the current Congressional interest in encouraging investment and expanding the "supply side" of the economy will result in more favorable tax laws and more realistic environmental programs. As a result, capital spending will grow somewhat faster than the economy overall, at a rate approaching 4% annually.

Investment at this rate should improve the nation's ability to address such current problems as inflation, lagging productivity, the energy shortage, and chronic trade deficits. It will also provide the base for continued growth of steel demand. Strong demand in construction, machinery, and related capital goods markets will more than offset the leveling in steel demand in the automotive market caused by the move toward smaller and lighter automobiles.

Accordingly, steel consumption is expected to increase by approximately 1-1/2% per year, reaching 134 million net tons of finished product in 1988 vs. 117 million in 1978. With appropriate public policies, it is projected that 117 million net tons will be provided by domestic suppliers, with imports of 20 million tons (15% of apparent consumption) from foreign suppliers (this is discussed in greater detail in Chapter V as Scenario I). These data are presented in Table IV-9.

[4] Hogan, William P., **Center Lines**, May, 1979.

Free World Steel Demand/Supply Balance Is Likely To Be Closer In Early 1980s When Capital Expenditure Activity Rises To More Normal Levels

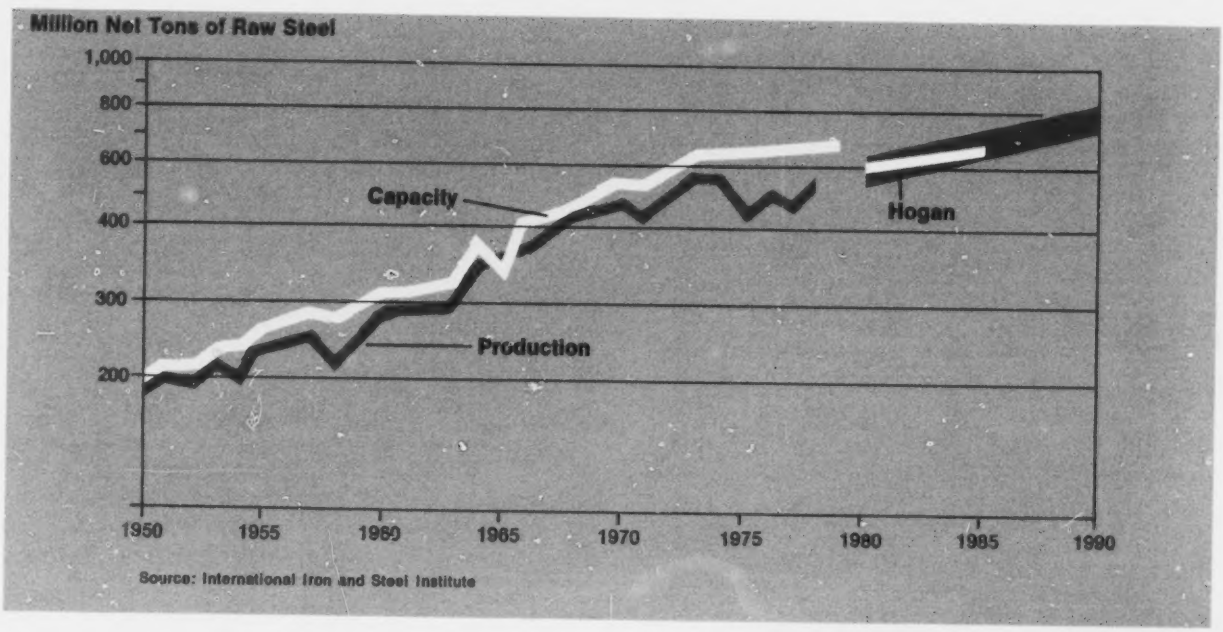

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TABLE IV-9

U.S.A. Consumption, Shipments, and Imports Are All Expected To Increase by 1988 (Million Net Tons of Finished Products)

	1978	1988
Consumption	117	134
Exports	2	3
Imports	21	20
Shipments	98	117

Source: American Iron and Steel Institute and various member companies.

G. Conclusions

Economic growth in both the world and the U. S. economy is expected to continue in the 1980s, although at a rate somewhat lower than that experienced in 1950-1975. This economic growth should foster higher levels of capital spending and steel consumption, although individual nations will no doubt experience differing rates of growth.

The recent recession in the world steel industry and accompanying serious financial deterioration have led to a reassessment of steel capital expenditure programs, with the result that many announced projects have been delayed while others have been canceled. Furthermore, considerable marginal capacity has been or appears to be in the process of being shut down. This has effectively put a damper on larger scale, near-term steel expansion worldwide.

The slow growth of steel capacity is likely to lead to a closer balance in world steel demand and supply in the 1980s. This is particularly important for the U.S.A. as a major net importer. If the domestic industry expands capacity to meet the projected shipments and production levels previously discussed, U.S.A. consumers will be able to have their steel requirements satisfied with lower contribution to inflation and less adverse consequences for the trade balance. If U. S. capacity is not increased, domestic users will inevitably pay higher prices for an enlarged volume of imports, and the balance of payments will suffer.

If U. S. customers do not support domestic expansion in the short run, they will have to suffer the costly consequences of greater reliance on offshore sources over the coming decade. Further import penetration will inevitably undermine the ability of the American steel industry to modernize and expand, and this will result in further job losses. Also, this will reduce its ability to fill any void created by a reduced supply of imports under shortage conditions.

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V The American Steel Industry at the Crossroads

. . . With appropriate government policies and improved profitability, steel companies will be motivated to make substantially increased capital expenditures. Installation of modern and efficient facilities will contribute to the health of the domestic economy by improving labor and energy efficiency, which in turn will help to control inflation, maintain employment levels, and reduce reliance on imports. Without appropriate government policies, there will be insufficient capital expenditures . . . aging equipment . . . lagging productivity . . . plant closings . . . lost jobs . . . increased reliance on imports . . . a growing steel trade deficit . . . and substantial price escalation. . .

A. Two Scenarios

The facts presented in previous chapters make it abundantly clear that the domestic steel industry is today threatened by a possible loss of its competitive position. The evidence includes low rates of return, creeping obsolescence, declining employment, and the failure to increase production capability over the past ten years.

In light of the above trends, it appears that the American steel industry is at a crossroads: Will it continue to decline? Or, with appropriate government policies and improved profitability, will it reach renewed health, growth, and vigor?

This chapter describes what are believed to be the two most likely alternative scenarios: Scenario I is a detailed assessment of future developments if public policies recommended herein by the domestic steel industry are in fact adopted by the government, to the benefit of not only this industry but the domestic economy as a whole. Scenario II outlines in only the broadest aggregates the plausible outcome of a continuation of recent trends.

Steel companies and their stockholders have for too long earned unacceptably low rates of return relative to what could be realized from alternative investments.

This situation must be remedied, but there is no single and exclusive cure. Several alternative routes to improved profitability are possible.

Steel producers regard the rapid modernization program in Scenario I as being in their own, their investors', and the economy's best interest. The severely downscaled industry illustrated in Scenario II, however, is a real possibility that could occur while individual steel companies attempt to improve their rates of return by investing in other, more attractive alternatives.

B. Scenario I: Planning for Aggressive Revitalization

Individual companies within the American iron and steel industry have their own raw material supply sources and sell products in their own market areas. Consequently, what "industry operations" will be in the future depends on actions taken by individual companies based on the needs of individual customers, the economics of alternative courses of action, and the availability of capital. The accuracy of a forecasted scenario is therefore vulnerable not only to external factors, but also to responses to those factors by the individual competing companies within the industry.

Nevertheless, it is necessary to assume an industry profile — theoretically forecast — to foresee what logically and reasonably *might* happen if an aggressive modernization program were carried out.

1. Present Operations

In 1978, the American steel industry produced 137 million net tons of raw steel and shipped 98 million net tons of steel products. Utilization of facilities was at 86.8% based on a reported 158 million net tons of raw steel capability. Chart V-1 shows the overall process steps in the production of steel from raw materials through finishing. The tonnages shown represent the aggregate of all operations in 1978 at the hundreds of locations that make up "the industry".

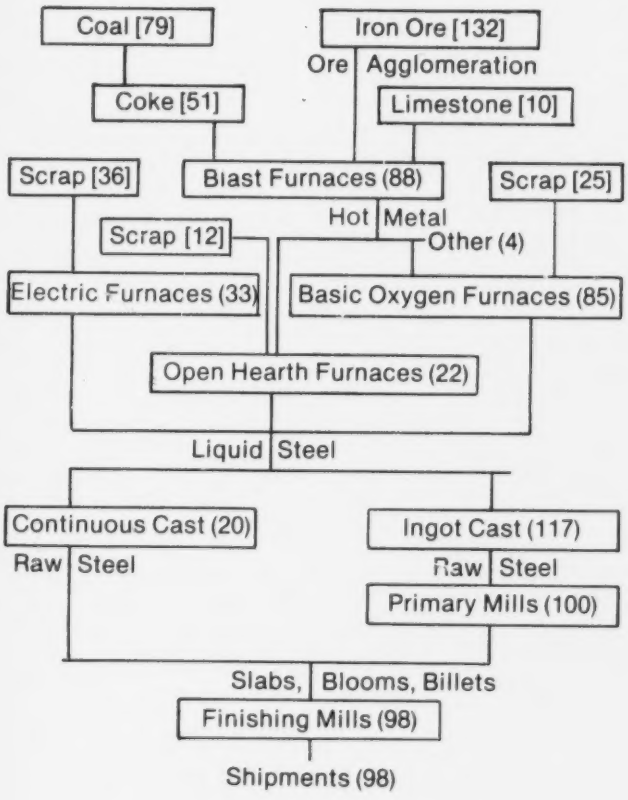
Most raw steel is currently produced in either basic oxygen furnaces (61%) or open hearth shops (16%) that consume "hot metal" (liquid iron) produced by blast furnaces. In these processes, the primary direct source of metallics is iron ore, although purchased steel scrap is also frequently consumed, depending on the percent of hot metal charged into the furnaces, and the amount of "home" scrap generated within the steel plant. The metallic charge in electric furnaces is usually 100% "scrap-based".

After refining in the steel furnaces, the liquid steel is either cast into ingots for subsequent rolling, or cast directly into a semi-finished shape (bloom, billet, or slab). Currently, 15% of all raw steel production in the United States is continuously cast. Rolled or cast semi-finished shapes are then rolled

and processed into the hundreds of finished steel products that make up the industry's shipments. Current average yield from raw steel to finished product is 71.5%.

CHART V-1

1978 Steel Production Involved Many Steps*
(Millions of Net Tons)



*Numbers in [ ] indicate tonnages of raw materials used; numbers in ( ) indicate tonnages of products produced by process.

2. Future Operations

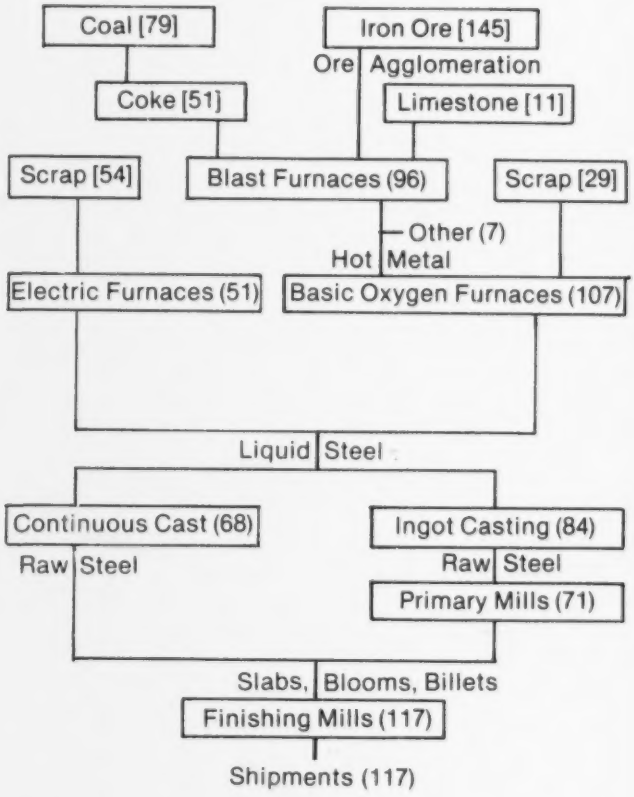
By 1988, domestic shipments are anticipated to grow to 117 million net tons per year, 19 million net tons more than 1978 levels.

Based on the estimated steel demand-supply relationships outlined in Chapter IV and the projection of domestic shipments in Table IV-9, utilization of facilities is expected to improve from the 86.8% rate of 1978 to an average of 90% over the next decade. This would provide an additional 3.6 million net tons per year of shipments [157.9 million net tons of capacity x (90.0% — 86.8%) x 71.5% yield]. Assuming a major modernization program is undertaken, overall yields could improve to 77% by 1988, adding another 7.8 million net tons of shipments per year [157.9 million net tons x 90% x (77% — 71.5%)].

Any portion of projected 1988 domestic shipments of 117 million net tons not met through higher utilization of facilities or increased yield from modernized plant (7.6 million tons in this example) could only be provided by the domestic industry through expansion. Chart V-2 shows how such a modernized and expanded industry might look as compared with the current 1978 configuration.

CHART V-2

1988 Steel Production Will Be Significantly Different from Present*
(Millions of Net Tons)



*Numbers in [ ] indicate tonnages of raw materials used; numbers in ( ) indicate tonnages of products produced by process.

3. Examples of Modernization Needs

a. Blast Furnaces

In 1978, there were approximately 180 blast furnaces in the United States.[1] Many of these furnaces are small in size relative to modern furnace design and do not have the technological features that result in lower manhours and higher fuel efficiency. For example, a small furnace may produce fewer

[1] American Iron and Steel Institute, **Annual Statistical Report**, 1978.

than 2,000 net tons/day of hot metal as opposed to 5,000-8,000 net tons/day with the new generation furnaces. The coke consumption can vary from 1,400 lb./net ton of hot metal in older furnaces to less than 900 lb./net ton in the more modern furnaces. While the largest of these furnaces may not be applicable to all steel plants, the operating and energy savings associated with modern furnaces require replacement of a substantial number of the older furnaces.

b. *Open Hearths*
As shown in Chart V-1, in 1978 about 15% of the steel was produced using the open hearth process as opposed to the more modern, cost-effective electric furnace (EF) or basic oxygen furnace (BOF). Considering that 15 years ago open hearths accounted for over 75% of steel production, it is evident that the industry has made substantial investments in implementing more modern tools. By 1988, however, all open hearths could be retired if sufficient funds were available. It is estimated that this tonnage would be replaced on a basis of approximately 50% EF's and 50% BOF's.

c. *Continuous Casters*
Installation of additional continuous casters, which produce semi-finished shapes directly from liquid steel, will greatly enhance the competitiveness of the industry by eliminating the extra process steps necessary in the traditional "ingot" route (i.e., pouring of liquid steel into molds, subsequent stripping of the molds from the solidified ingot, reheating the ingot, and rolling the ingot into semi-finished shapes). Many old blooming, billet, and slab mills (all of which produce semi-finished shapes from ingots) could be shut down. Savings will accrue in yield, labor, and energy. Estimates of yield savings vary with market conditions, product mix, scheduling constraints, and relationships with other primary mill facilities operating within the plant. However, the range in improvement has been estimated at anywhere from 8% to 15% per net ton of finished product.[2,3] Energy savings by continuous casting instead of the ingot route are also substantial. They range from 1.5-2 million Btu/net ton of slab or billet, depending on the steel process that is supplying the liquid for casting.[4]

Today approximately 15% of the American steel industry's raw steel production is continuously cast. This is far below Japan's 46%.[5] Given current technology and product mix, it is assumed that 45% of raw steel production in the United States will be continuously cast by 1988. Higher rates of continuous casting might be possible with further technological advances that would permit more types of finished products to be made from continuously cast steel.

d. *Retirement of Old Equipment*
In addition to replacing obsolete processing facilities similar to those mentioned above, significant portions of other equipment must be replaced, not necessarily for the sake of cost savings, but because the equipment has reached the end of its useful life. An example of this type of modernization expenditure is the industry's coke oven batteries. Over one-quarter of all coke ovens in the United States are more than 25 years old.[6] By 1988 approximately 1/2, or 30 million net tons per year, of coking capacity must be replaced if the American steel industry is to supply its own coke. The alternative of importing foreign coke results in importing energy rather than using sources available within this country, and would leave the American steel producers vulnerable to a potential shortfall of world coke supplies.[7]

The age distribution of finishing mills varies greatly from company to company and plant to plant. Some older mills have been rebuilt, but many rebuilt mills do not have modern gage controls, efficient reheat furnaces, or sufficient power — all of which are necessary to make products of optimum metallurgical quality and close dimensional tolerances.

4. *Required Scope of Modernization Effort*
As noted earlier in this paper, it is assumed that a modern, competitive steel industry should have a replacement cycle of 25 years. This would involve a replacement rate of 4% per year. By 1988, with modernization and expansion, steel shipments are projected to reach 117 million tons. Average steel shipments over the next ten years, assuming a 90% operating rate, are projected to be 109.3 million net tons annually (average of projected shipments 1979 to 1988). A 4% replacement rate would call for the replacement of the equipment necessary to produce 4.4 million tons of finished steel per year over the next ten years.

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[2] Industrial Economics Research Institute. Fordham University, **Purchased Ferrous Scrap, United States Demand and Supply Outlook**, June, 1977.

[3] International Iron and Steel Institute, **A study of the Continuous Casting of Steel**, Committee on Technology, Brussels, 1977, Appendices 26 and 27.

[4] Based on estimates made by various American Iron and Steel Institute member companies.

[5] **Iron and Steel Engineer**, International Iron and Steel Institute Statistics for 1978, as reported, August, 1979.

[6] McGraw-Hill, **World Steel Industry Data Handbook**, Vol. 1: the United States, 1978.

[7] **Business Week**, November 20, 1978, Pages 73-76.

5. *Facility Requirements for Expansion*

Higher rates of capacity utilization, improved yields, and expanded capacity could make possible 117 million tons of domestic shipments by 1988. Although increased capacity utilization and higher yields would provide most of the shipments' growth (from 1978 levels), 7.6 million tons of additional shipments are projected from capacity expansion. Assuming an 84% yield in new facilities (since essentially all capacity additions would probably involve continuous casting) and 90% capacity utilization, 10 million tons of added raw steel capacity would be required to make possible an added 7.6 million tons of shipments.

The expanded capacity, and the resulting increase in shipments, would probably be supplied 50% by the integrated facilities, and 50% from electric furnaces. For this reason, and because of the reduction in coke rates made possible by modernization, the expanded capacity of 10 million tons of raw steel would be possible with limited expansion in raw material facilities, coke ovens, blast furnaces and steel furnaces for the integrated facilities.

6. *Results of Modernization*

The hypothetical modernization efforts described above would result in increased efficiencies that would ensure a more competitive domestic steel industry compared with other world producers. Specific examples of where improvements would occur are:

a. *Attainable Manhour Productivity Gains*

Approximately 50% of existing coke oven capacity must be replaced by 1988. Modern coke batteries that produce 850,000 net tons per year of coke (compared with 250,000 net tons per year by batteries built in the 1950s) would bring labor savings of roughly 50%.

Shutting down the open hearths and replacing steelmaking capacity with EF's or BOF's will result in major savings. It is not unusual for ingots produced in basic oxygen furnace shops to take fewer than half the total manhours of those produced via the open hearth process.

By installing additional continuous casters and shutting down old primary mills, savings in manhours accrue by eliminating ingot mold handling, soaking pit, and rolling mill operations. Manhours per net ton of cast slab have been estimated at 50% of those required in production of slabs via the ingot process.[8] Increased applications of computer controls to production scheduling and process control, modern finishing facilities with higher tons/hour, greater yield, and more automation — all lead to higher labor productivity. Although total manhours per net ton of finished product varies with product mix, scheduling practices, and local labor practices, it is generally recognized that modern plants can operate at approximately half the total manhours of older plants.

It is estimated that under the aggressive modernization program outlined here, the new facilities would require 5 manhours per ton of finished product — approximately 45% below the current average. By 1988, average manhours per ton in all facilities (carbon, alloy, and stainless) would then be 7.2 as compared to a current 9.0 — a 20% reduction as shown in Table V-1. Clearly this indicates a substantial increase in labor productivity.

b. *Sustained Employment*

Although there will be substantial improvements in labor productivity, the increased shipments potential under Scenario I will make it possible to maintain employment at approximately the current levels as shown in Table V-1.

c. *Reduction in Coke Rates*

The blast furnace is the largest single energy consumer in the process of steel production. The basic energy form used in the production of pig iron is metallurgical coke which averages 24.4 million Btu heating value per net ton of coke. Companies that operate blast furnaces pay close attention to coke rates that express the coke consumption relative to hot metal produced. Industry *average* coke rates in 1978 were .59 net tons coke per net ton of iron produced. However, the range in consumption varies from .70 to .45. Modern blast furnaces with high top pressures, improved burden control, and higher blast temperature and wind volumes are able to obtain very substantial operating cost and energy savings. In estimating overall coke rate improvements by 1988 it has been assumed that 20% of the existing old furnaces with "high coke rates" would be replaced with modern furnaces. The results in average industry coke rates are calculated below:

% of Furnaces	Coke Rate[9]
20% New	.45
80% Old	.55
Average	.53

[8] **A Study of the Continuous Casting of Steel**, supra.

[9] In replacing "old" furnaces it is assumed the least efficient furnaces would be taken out of service, thus the remaining average coke rate decreases from 1978s .59 to .55 as shown.

TABLE V-1

Projected Employment Requirements in 1988 Would be About The Same as During 1978

	1978			1988		
	Production MNT per Year	Manhours per Net Ton	Million MH per Year	Production MNT per Year	Manhours per Net Ton	Million MH per Year
Coke Batteries	51.0	.91	46.4	51.0	.65	33.2
Blast Furnaces	88.0	.96	84.5	96.0	.75	72.0
Steel Producing Shops:						
Electric Furnace	33.0	1.13	37.3	51.0	1.02	52.0
Open Hearths	22.0	1.05	23.1	—	—	—
Basic Oxygen	85.0	.40	34.0	107.0	.36	38.5
Strand Casters	20.0	.75	15.0	68.0	.45	38.6
Ingot Casting	117.0	.28	32.8	84.0	.26	21.8
Primary Mills	100.0	.61	61.0	71.0	.59	41.9
Finishing Mills	98.0	5.00	490.0	117.0	4.26	498.4
Selling, Genl. & Adm.	98.0	.60	58.8	117.0	.50	58.8
Shipments of Finished Steel Product	98.0			117.0		
Plus: Estimated Increase in Mill Inventory (Equivalent Finished Product)	1.7	5.60	9.5	—	—	—
Totals	99.7	8.95	892.4	117.0	7.24	847.2
Average Number of Employees (000)			449			427
Average Hours Worked per Week			38.1			38.1
Average Manhours/Employee/Year			1,986			1,986

Source: Estimated by American Iron and Steel Institute Member Companies

d. Energy Savings in Steelmaking

Most of the energy required in the production of steel mill products is consumed in early stages of steel refining. Starting from raw materials, liquid steel produced via the BOF and open hearth production process takes roughly 20 million Btu per net ton while electric furnaces starting with scrap take only 8 million Btu per net ton.[10] This assumes no energy value for the scrap consumed, but includes all energy contents of hot metal fuels and electricity. By increasing yield from liquid steel to semi-finished blooms, billets, and slabs, casters reduce the amount of liquid steel that must be melted to support an annual ton of shipment. Casters also eliminate downstream reheating steps in the primary mills.

When considering these two components (higher yield and lower Btu consumption per net ton of slab or billet produced) casters save from 1.5-2 million Btu per net ton of slab or billet produced. This equates to perhaps 2-3 million Btu per net ton of product — a major improvement when one considers that average energy consumption in the steel industry including mining and transportation runs about 34 million Btu per net ton of shipments. This savings can be reflected in less consumption of fuel oil or natural gas. Studies of probable energy consumption in new steel plants indicate savings on the order of 35% per ton of finished product compared with existing facilities. Assuming purchased scrap is available in sufficient quality and quantity, the shutting down of open hearths and production of higher percentages of raw steel in electric furnaces will result in substantial reductions in industry energy needs. This, combined with other modernization steps, could reduce energy requirements by roughly 15% per net ton of shipments by 1988. These savings would be equivalent to approximately 75 million barrels of oil per year. Assuming that these sources would result in reducing imports of oil into the U.S.A., our nations balance of trade would be improved by $1.5 billion per year ($20 a barrel).

e. Improved Yields

The yield from raw steel to finished shipments currently averages about 71.5%. Based on approximately 20 million net tons of cast blooms, billets, and slabs, the representative component yields are as shown below:

[10]Based on estimates made by various American Iron and Steel Institute member companies.

Average Yield in 1978 was 71.5%

Raw Steel (millions N.T.)	Primary	Finishing	Total	Shipments (millions N.T.)
117 Ingots	85%	82%	70%	82
20 Continuous Cast Shapes	—	82	82	16
137 Raw Steel			71.5%	98

By 1988 the steel industry could produce 45% of raw steel via casters, and modernized finishing mills could operate with higher yields through improved reheat furnace design, computer controls, closer tolerance of finished product, etc. The net impact could result in a 77% overall yield as shown below:

Average Yield in 1988 could be 77%

Raw Steel (millions N.T.)	Primary	Finishing	Total	Shipments (millions N.T.)
84 Ingots	85%	84%	71.5%	60
68 Continuous Cast Shapes	—	84	84	57
152 Raw Steel			77%	117

f. A More Competitive and Profitable Industry: Scenario I is expected to result in a significantly more cost-competitive industry by 1988. The aggressive revitalization effort envisioned under Scenario I will reduce the average age of steel industry equipment by 20% (from 17.5 years to 14 years), improve labor productivity by 20%, improve energy efficiency by about 15%, and increase yields by about 8%. Further, although no savings will occur in either ore or scrap costs per ton of finished product, savings in other materials and supplies of up to 10% might be possible. Finally, improved average capacity utilization rates are expected to be important in reducing costs. In terms of total operating costs, cost savings (in 1978 $) of approximately 15% by 1988 (as compared to 1978) might be feasible. Partially offsetting the operating cost reductions under Scenario I will be the increased capital costs incurred as a result of the capital expenditures made. However, if most of the capital expenditures are financed from retained earnings (see Chapters VI and VII), the increased capital costs resulting from capital expenditures on productive steel facilities are expected to be substantially overshadowed by the operating cost savings noted earlier. Thus, the net result of the revitalization is expected to be better profit rates for the industry.

Table V-2 summarizes the added output that can be achieved through a combination of higher utilization, improved yields, and added capacity.

TABLE V-2

The Sources of Increases in Steel Shipments (Millions of Net Tons of Shipments)

1978 Shipments	97.9
Higher Utilization (90% vs. 86.8%)	3.6
Expansion (10 million net tons raw steel capacity)	7.6
Improved Yield (77% vs. 71.5%)	7.8
1988 Shipments	116.9

7. Capital Cost of Modernization and Expansion

Scenario I envisions replacement of facilities producing 4.4 million net tons of steel shipments annually. Assuming replacement costs of $1,000 per net ton (1978 $) of finished product as shown in Table V-3, an average of $4.4 billion will be required each year for the next ten years (and for the full replacement cycle of 25 years) just for steel replacement and modernization.

Scenario I also visualizes increased shipments totalling 19 million net tons over the next ten years, of which 7.6 million tons will be made possible by expanded capacity. Assuming capital costs of $650 per net ton (1978 $) of finished product, as shown in Table V-3, a total of $5 billion will be required for expansion by 1988, or an average of $.5 billion per year over the next ten years.

The modernization and expansion program summarized above will thus necessitate capital expenditures of $4.9 billion per year, 1979-1988, for modernization and expansion of steel facilities only.

TABLE V-3

Replacement and Expansion of Steel Facilities Is Expensive (1978 $)

		Raw Steel Production $/N.T.	Finished Product Shipments $/N.T.
Full Complement of Replacement Facilities			
Integrated Facilities:	Raw Materials and Transportation	$190.	$ 225.
	Coke Ovens, Blast Furnaces, Rolling Mills	800.	950.
	Total	$990.	$1175.
Electric Furnace Facilities (including Rolling Mills)		420.	500.
All Facilities (Approx. 25% Electric)		$840.	$1000.
Expansion			
Integrated Steel Facilities		$ 630.	$ 750.
Electric Furnace Facilities		460.	550.
All Facilities (50% Electric)		$545.	$ 650.

Source: Based on estimates of American Iron and Steel Institute member companies. Expansion of integrated steel production capability is assumed to require less than a full complement of facilities (e.g. little increase in raw materials, coke ovens, blast furnaces, and steel furnaces).

C. Scenario II: A Continuation of Current Trends

The causes of the trend to a less competitive domestic industry include a slow-growing market for domestic steel and a less-than-hospitable climate for capital formation in the U.S., complicated by costly government tax and social policies, ineffective trade policies, and ill-conceived price constraints. Perhaps the most significant factor is inadequate capital formation. Unless major policy initiatives to support a dramatic resurgence in capital expenditures are forthcoming, the trend to a less competitive domestic steel industry will continue. This would be most unfortunate for American steel producers, steel workers, steel consumers, and the American economy.

The following scenario will briefly outline what might happen with a continuation of current poor rates of return and resulting inadequate capital expenditures.

1. Older Facilities Will Result from Continued Inadequate Capital Expenditures

In the last ten years, productive capital expenditures in steel (total capital expenditures of steel companies, excluding non-steel and environmental expenditures) have averaged just over $2 billion per year (1978 $) — far from sufficient to maintain a competitive industry. If productive capital expenditures continue at a $2 billion rate for the next ten years[11], the average age of equipment (assuming current productive capability is maintained) would increase from 17.5 years to almost 20 years — completely unacceptable for even borderline cost competitiveness. This would mean that approximately 25% of equipment capacity would be over 25 years of age by 1988, as compared to the current 20% shown in Chapter III.

While one could theoretically imagine the industry operating with older and older equipment, the implied inherent loss of competitive position makes this a practical impossibility. Given current inadequate rates of return, domestic producers are not in a position to absorb further losses of competitive position. Thus, if capital expenditures continue at their current inadequate levels, the inevitable result will be even older equipment and a loss of competitiveness that will force plant closures. American steel producers have reached the point where rates of return and capital expenditures have been too low for too long. Both must increase significantly from current levels, or production capability will sharply decline.

If $2 billion per year (or less) is an insufficient level of modernization and replacement capital expenditures, what is required? To maintain current production capability and the same average equipment age, expenditures of $3.0 billion per year will be required over the next decade, but merely preserving the current replacement cycle (35 years) would be a losing game, because foreign competitors are modernizing rapidly. To remain competitive, American steel producers must do likewise.

2. Capacity Will Decline if Financial Conditions Do Not Improve

Assuming productive capital expenditures remain at $2 billion per year, this would be sufficient to make possible only a 2% per year replacement of existing productive capability (equivalent to a 50-year replacement cycle) at an assumed operating rate of 90%.[12] Clearly this is not enough to sustain the industry, and certainly no expansion in raw steel production capacity would be likely. Over the next decade, if rates of return do not improve, and expectations for improvement remain pessimistic, noneconomic facilities will be eliminated. A reasonable assumption would appear to be that up to 20% of production capacity might be eliminated. Thus, raw steel production capacity might decrease by as much as 25 to 30 million net tons.

3. Imports Would Probably Increase and Domestic Shipments Would Fall

If the domestic industry is not financially able to modernize and expand its productive capacity, imports will probably capture an increasing proportion of the domestic market. By 1988 imports could be as much as 50 million net tons, with 85-90 million net tons of domestic shipments. Domestic customers would have to rely on the *willingness* of foreign producers to meet domestic requirements at "reasonable" price levels. In 1973-74, foreign producers reduced their steel shipments to the United States since they were experiencing strong demand in their home markets, and they charged premium prices for the steel that they did ship to this country.

4. Steel Industry Employment Will Decline

As many as 90,000 jobs will be lost if industry capability declines by approximately 20% as projected above. This drop in employment, although enormous, understates the problem as it does not take into account an expected drop in employment in raw materials and other steel-related industries.

5. Steel Industry Cost Competitiveness and Profitability May Increase

The above noted drop in production capacity, since it will eliminate older facilities, will mean that by 1988 what remains of the American steel industry may be somewhat more cost competitive and profitable than is currently the case. Market scarcity (caused by inadequate steel supplies from American

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[11] It is not clear, however, that productive capital expenditures can continue even at the $2 billion rate. Total capital expenditures over the past decade averaged $2.9 billion (1978 $). If environmental (and OSHA) costs take larger and larger portions of the $2.9 billion total, then productive steel capital expenditures will fall below the $2.0 billion rate. If this happens, the results would be worse than Scenario II envisions.

[12] Little, Arthur D., Inc., **Limited Life Facility and Plant Vulnerability**, August, 1979.

producers and from foreign producers committed primarily to serving their home markets) will result in strong upward pressure on prices. U. S. government "jaw-boning" can be expected to have little impact in these circumstances.

D. Comparison of Principal Results Under Scenarios I and II

Table V-4 contrasts the situations portrayed by Scenarios I and II.

1. Meeting the Needs of the American Market

Chapter IV forecasts steel consumption for the world and the United States. Domestic steel consumption is projected to rise by 1.5% per year into the late 1980s. Thus, by 1988, apparent steel consumption will increase from 117 million net tons to 134 million. Who will supply this increase?

Under Scenario I, domestic shipments would reach 117 million tons, with much of the increase attributable to higher yield, and higher utilization of existing capacity. Under Scenario II domestic shipments would actually decline from the 1978 level of 98 million tons to between 85 and 90 million tons.

Correspondingly, Scenarios I and II have profoundly differing implications for steel imports. Under Scenario I, imports are 20 million tons annually by the end of the study period, while under Scenario II, they could climb as high as 50 million tons. In Scenario I the level of imports will represent 15% of the domestic market, contrasted with Scenario II's percentage, which could be as high as 40%.

Scenario II's vastly increased reliance on foreign sources of supply could have disastrous consequences for the nation, as well as the industry. Steel consumers of this nation, under Scenario II, could be as much at the mercy of foreigners as are petroleum users. It has been demonstrated that during periods of shortages, foreign steel is withheld from American buyers in order to serve the domestic needs of the foreign producers. Moreover, such shortages result in drastic increases in world prices that must be borne by American customers unable to obtain domestic steel.

If the import ratio is modest, such as under Scenario I, the severity of the consequences of any world steel shortage would normally be mild. However, with exceptionally large import ratios, the impact of any worldwide shortfall on prices and/or industrial production could be catastrophic. In view of the fact that many foreign steel industries are government-owned, under Scenario II U. S. consumers could be subject to cartel pricing arrangements similar to those imposed by OPEC.

A further implication of Scenario I versus II is the magnitude of the balance of payments problem. Assuming steel is valued at $400 per ton, Scenario I suggests a future annual steel trade deficit of $7 billion versus perhaps $20 billion under Scenario II.

2. Employment and Labor Productivity

The heavy reliance on foreign supply under Scenario II is also of crucial importance in terms of employment. Table V-4 shows that the number of employees engaged in the production and sale of iron and steel products will decline by as much as 90,000 under Scenario II, but could remain at approximately current levels under Scenario I. Although Scenario I assumes greater productivity in terms of manhours per ton, increased output keeps employment levels from decreasing significantly.

TABLE V-4

Scenario I Has Beneficial Results Whereas Scenario II Has Harmful Results

	1978		1988	
			Scenario I	Scenario II
Capital Expenditures (1978 $ Billion) Productive Steel	$2.0	(69-78)	$4.9	$2.0
Apparent Steel Consumption (million tons)	117		134	134
Domestic Shipments (million tons)	98		117	As Low As 85
Imports (million tons)	21		20	As High As 50
Exports (million tons)	2		3	2
Imports As Percent Apparent Consumption	18%		15%	As High As 40%
Raw Steel Capacity (million tons)	158		168	As Low As 130
Employment in Steel Operations Only (thousands)	449		427	As Low As 360
Steel Trade Deficit ($ billion at $400/ton)	$7.5*		$7	As High As $20

*Actual 1978 deficit was $5.6 billion (at $300/ton)

Under Scenario I, manhours per ton would be substantially lower than under Scenario II.

3. Energy Use

Clearly, one of the problems faced by the steel industry is that it is an energy-intensive industry in a time of high energy costs. Under such circumstances, every effort to reduce energy must be made. Under Scenario I it is estimated that average energy use per ton would decrease by 15% by 1988, whereas under II, decreases in energy use per ton would be minor.

4. Inflation

Throughout the 1970s, the nation's most severe economic problem has been the high and rising rate of inflation. It is entirely possible that inflation on average during the 1980s will be even more severe than during most of the past decade.

Installation of more modern facilities helps to control the general rate of inflation by contributing to improved productivity and by helping to assure a plentiful supply of goods (as shown in Table V-4) and thus avoiding scarcities. Scarcities — real or perceived — lead to rapidly rising prices for the scarce commodity (fuel oil in 1979, for example).

5. A More Competitive and Profitable Industry

Under Scenario I the measures one would use to assess increased competitiveness (e.g., improvements in yield, manhours per ton, energy efficiency, and average equipment age) all would show substantial gains. Thus, under Scenario I a more competitive and profitable industry should emerge than currently exists and than would be likely under Scenario II.

* * *

Summary

Clearly, Scenario I is the more desirable alternative for all parties concerned. However, it requires unprecedented levels of capital expenditures. Such spending is necessary, but will not take place given current rates of return and cash flow. Steel manufacturers have to begin earning rates of return that are in line with the average for all manufacturing industries. Further, improved capital recovery is essential if the companies are to generate the higher cash flow necessary to make possible the necessary investment levels.

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VI $7 Billion Per Year Will Be Required to Modernize the American Steel Industry

. . . The American steel industry needs to more than double its average annual capital expenditures during the next decade—$4.4 billion for modernization and replacement; $0.5 billion for expansion of productive capacity; $0.8 billion for environmental and health-related outlays; $0.5 billion for debt retirement and working capital; and $0.8 billion for non-steel—an average of $7 billion per year.

A. Future Capital Requirements

Chapter V estimates that the American steel industry needs to spend $4.4 billion per year to modernize and replace productive capability and $0.5 billion per year to provide additional steel production capacity. In addition, substantial funds are needed to comply with environmental control and industrial health standards, to meet requirements of the non-steel activities of steel companies, for increased working capital requirements, and for debt repayment. These additional requirements are discussed below.

1. *Environmental Control and Industrial Health*

a. Compliance for Existing Plants

The Clean Air Act of 1970 and the 1972 Amendments to the Federal Water Pollution Control Act, as well as the establishment of the various environmental regulatory agencies at the federal, regional, state and local levels, have imposed heavy burdens on the American steel industry.

The consulting firm of Arthur D. Little, Inc. was commissioned by AISI to perform an in-depth study of the effect on the American steel industry of these various regulations and regulatory bodies. This study, issued in May, 1975, was a thorough, objective review of the cost impact of pollution abatement on AISI member companies.[1] In May, 1978, Arthur D. Little revised this study based on 1976 industry conditions and costs as well as on current and projected regulatory standards.[2] The latter study is currently being updated.

The May, 1978, Arthur D. Little report projects that compliance with long-term air and water regulations for existing plant and equipment will require capital expenditures of at least $600 million per year through 1985 for a total of $4 billion. This amount does not include cost estimates for either the requirement of zero discharge of water pollutants or for post 1985 air standards. Although detailed estimates of the cost of meeting these latter requirements are not currently available (but are being developed), order of magnitude estimates indicate that an additional $3 billion may be required. Thus total environmental control expenditures for the next decade may reach $7 billion or an average of $700 million per year.

Surveys made by AISI with regard to industrial health standards for noise, lead, sulfur dioxide, benzene, and carcinogens, indicate that at least $100 million per year will be necessary to comply with these requirements.

To meet all environmental and industrial health standards, it is estimated that the industry will need to make capital expenditures of at least $0.8 billion per year during the next decade.

b. Compliance for New Plants

The cost of compliance with environmental control and industrial health standards associated with new plants for either roundout, "brownfield", or "greenfield" expansion is included as an integral component of the cost of new plant capacity (and not included in the $0.8 billion per year estimate noted above).

2. *Non-steel-related Capital Expenditures*

Companies in the American steel industry are engaged in lines of business in addition to steel manufacturing. These non-steel businesses have made important contributions to industry internal cash flow, and provide stability during cyclical steel downturns. Some of the non-steel businesses that the steel industry is currently involved in include: development of energy resources; development and sales of raw materials; public transportation of raw materials and other commodities; production and sale of various chemicals and plastics; fabrication and erection of buildings, bridges, and ships; fabrication and sale of oil field equipment; production and sale of cement; development of real estate holdings; and various financial services.

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[1] Arthur D. Little, Inc., **"Steel and the Environment: A Cost Impact Analysis."** May, 1975.

[2] Arthur D. Little, Inc., **"Steel and the Environment: A Cost Impact Analysis-1978."** May,1978.

An AISI survey of non-steel activities by reporting companies representing 72% of industry shipments indicates that in the four-year period, 1975 through 1978, the companies made non-steel-related capital expenditures averaging approximately $600 million per year (1978 $).[3] Factoring this amount to a level representative of the entire industry, non-steel capital expenditures are projected to total at least $800 million per year (1978 $) during the next decade.

The above-mentioned AISI survey indicated that the cash flow contributed by non-steel operations exceeded non-steel capital expenditures in each of the years, 1975 through 1978. Thus, the contributions from non-steel businesses provide a more stable earnings base for companies whose core business is subject to fluctuations in steel demand.

3. Other Capital Requirements

a. Debt Repayment

Funds needed to repay debt in the future must be considered in order to complete the analysis of capital requirements. In the 1976-1978 period, long-term debt maturing within one year has averaged more than $250 million for AISI-reporting companies and is growing. Although it is impossible to establish the debt retirement needs of non-AISI members, it is assumed that $400 million per year will be required over the next ten years.

b. Increases in Working Capital

Working capital — the excess of current assets over current liabilities — has averaged about 14% of sales during 1976-1978:

TABLE VI-I

Working Capital of American Steel Companies Has Averaged About 14 % of Sales (Billion $)

Year	Sales	Working Capital	%
1976	$36.1	$5.7	16%
1977	39.4	5.6	14
1978	46.4	5.9	13
Average	$40.6	$5.7	14%

Source: American Iron and Steel Institute — **Annual Statistical Report**, 1978.

If finished steel product shipments increase by 19 million tons by 1988, this would be equivalent to an increase of approximately 1.9 million tons of additional steel product shipments per year. Based on these additional shipments and an average 1978 steel product selling price of $435 per ton, industry revenues would increase by about $830 million per year (1978 $). By applying the 14% factor, working capital requirements would increase by $100 million.

4. Summary of Total Annual Capital Requirements of the American Steel Industry

Table VI-2 summarizes the total annual capital requirements of the American steel industry during 1979-1988.

TABLE VI-2

Annual Capital Requirements of The American Steel Industry Total $7.0 Billion

	Billions 1978 $
Capital Expenditures	
Replacement and modernization of present steel production capacity	$4.4
Additional steel production capacity	.5
Environmental control and industrial health facilities for existing plant	.8
Non-steel	.8
Total Capital Expenditures*	$6.5
Other Capital Requirements	
Debt repayment	$ .4
Increases in working capital	.1
Total Other Capital Requirements	$ .5
Average Annual Total Capital Requirements	$7.0

*Based on Estimates of American Iron and Steel Institute member companies. Estimates indicate annual capital expenditures could range between $6.0 — $7.0 billion per year.

B. Phasing in Capital Expenditures

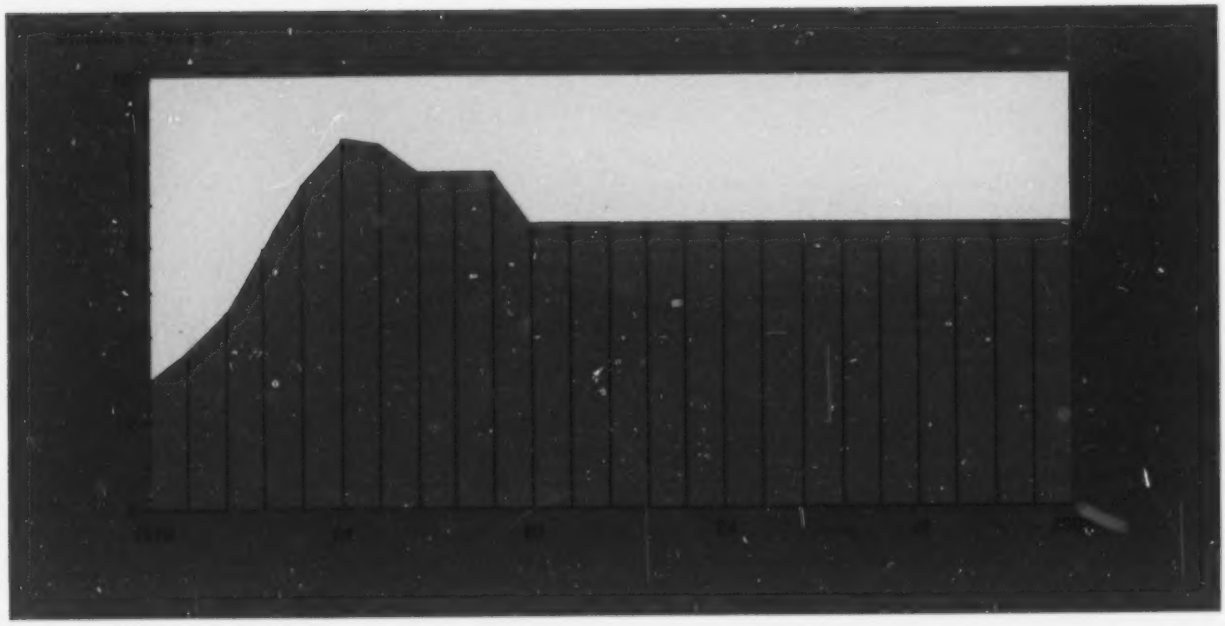
Capital expenditures in the last decade have averaged less than $3.0 billion per year. Thus, it will be difficult to increase expenditures immediately to an average of $6.5 billion per year. Rather, this level of capital expenditures will have to be phased in over an extended period of time. There are a number of different patterns one could envision. Chart VI-1 below illustrates one possible approach in which capital expenditures will peak in 1984, decline rather sharply, and then level off. A more rapid phasing-in would be virtually impossible given the present limited capacity of capital goods producers supplying the American steel industry.

Since capital expenditures in the domestic steel industry have been relatively low for a number of years, builders of coke ovens, blast furnaces, rolling mills, etc., have been less active. However, it is assumed that if the steel industry were able to make large capital expenditures, these equipment suppliers would expand their capacity rapidly and train the necessary work force. Once suppliers have geared-up, capital expenditures in excess of the annual $6.5 billion average can be achieved. The high level of capital expenditures in the mid-1980s reflects the necessity of installing many pieces of interrelated equipment in a short period of time. Since Scenario I is based largely on replacement and modernization of existing facilities, it becomes imperative to compress the major replacements into as short a time span as possible, if production levels are to be maintained.

[3] American Iron and Steel Institute, Special Survey.

CHART VI-1

Steel's Revitalization Requires Phasing in Of Capital Expenditures



Scenario I proposes a much faster replacement cycle (25 years) than has been the case in the recent past. The replacement cycle would continue indefinitely, but the first cycle would not be completed until 2003. The ten-year period, 1979 to 1988, would merely make up for lost time and put the industry in a position to maintain this replacement cycle. In order to sustain the cycle after 1988, annual capital expenditures of approximately $6.5 billion (1978 $) would continue to be required.

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VII The Steel Industry Requires Higher Rates Of Return and More Rapid Capital Recovery to Meet Capital Requirements of $7 Billion Per Year

. . . Low rates of return and current U.S. tax laws have severely constrained the steel industry's ability to meet its capital requirements. Rates of return must be improved and U.S. tax laws must be changed to divorce capital recovery for the so-called "useful life" concept and provide much faster capital recovery. Although real revenue increases will be required in the early years of modernization to balance off cash outflows, more rapid capital recovery should provide the funds required to finance the modernization program. Once completed, the modernization program should provide the steel industry with a competitive rate of return and steel consumers with a potential reduction in real prices. Tax law changes to accelerate capital recovery are anti-inflationary.

A. Components of Capital Availability

The funds available to any firm to meet its capital requirements come from three principal sources: (l) capital recovery (depreciation); (2) reinvested earnings (net income less dividends); and (3) issuance of debt and/or equity. In the case of the steel industry, these funds are necessary for replacement, expansion, environmental, and non-steel capital expenditures plus debt retirement and increases in working capital.

In the final analysis, capital outlays and capital availability must be in balance, with the amount of capital available determining the extent to which capital requirements are met.

One way to view the balancing of capital needs and sources is to match each type of capital requirement and each component of capital availability. For example, capital recovery should balance capital expenditures for modernization and replacement, since capital recovery is intended to replace worn-out facilities. Reinvested earnings and issuance of debt and equity are used for debt repayment, working capital increases, and the expansion of the enterprise.

The relationships described above do not provide any funds for environmental retrofitting of existing facilities. Normally, environmental expenditures are included in modernization and thus financed with capital recovery. However, retrofitting of existing facilities to meet new environmental or other standards was not envisioned at the time of original construction and funds from capital recovery are not adequate to offset these retrofitting costs. Accordingly, it is difficult to imagine how these imposed and non-economic requirements could be met without foregoing other capital needs, unless added revenues are provided through price increases.

B. Past Balance of Capital Requirements And Capital Availability in the American Steel Industry

Since 1969, capital expenditures, in constant dollars, by the American steel industry have been very low, averaging approximately $2.9 billion per year (in 1978 $). Of this amount, only $2.1 billion per year was spent for replacement of steel-producing facilities. This compares with $4.4 billion per year (in 1978 $) needed for steel equipment replacement, and total capital spending needs of $6.5 billion per year during the next decade.

Inadequate funds have severely constrained the steel industry's ability to meet its capital requirements. The two major problems have been inadequate rates of return and tax laws that impede capital recovery. A sizeable increase in the industry's debt/equity ratio — from 35% in 1969 to 42% in 1978 — has been required to supplement retained earnings and funds available from capital recovery merely to accomplish the relatively low level of spending that has occurred. Since there has been essentially no net expansion over the past 10 years, the use of reinvested earnings and debt to finance capital expenditures for replacement demonstrates that capital recovery has been insufficient for its intended purpose.

Capital recovery has not been sufficient for the following reasons: Rates of capital recovery are too slow under current tax laws; capital recovery based on historical costs is inadequate to fully cover replacement at today's inflated costs; and capital

recovery funds have been diverted to meet imposed environmental standards rather than used for their intended purpose.

C. How Current Tax Laws Have Impacted Capital Availability in the American Steel Industry

1. Capital Cost Recovery

Capital recovery is very slow for the steel industry under current U. S. law. This slow recovery presents a major problem in any attempt to embark on an accelerated capital expenditure program because enormous cash shortfalls occur in early years. These shortfalls can be recouped, but at a much later time.

This long time frame has even more profound implications in an inflationary economy. Since capital recovery is based on historical costs, only part of the cost of replacing worn-out facilities is recovered. Over the past ten years, plant and equipment costs have almost doubled.[1] Thus, if $100 were spent in 1968 to buy two pieces of identical equipment, by 1978 the capital recovery from the original $100 expenditure would only allow replacement of one of them.

As shown in Table VII-1, steel industry assets have one of the longest guideline depreciable lives of any American industry. Products that compete directly with steel (wood, plastics, rubber products, aluminum, and copper) all have shorter tax lives.

TABLE VII-1

Steel Has One of the Longest Capital Cost Recovery Periods

Assets Used in the Manufacture of:	Guideline Lives—Years*
Electronic Equipment	8.0
Chemicals	9.5
Textiles, Yarns, Fabrics (Avg.)	9.0
Wood Products	10.0
Plastics	12.0
Electrical Equipment	12.0
Motor Vehicles	12.0
Fabricated Metal Products	12.0
Aluminum and Copper	14.0
Rubber Products	14.5
Steel	15.0
Cement	20.0
Average for All Manufacturing Industries	12.0

*Actual tax depreciation lives could vary plus or minus 20%.

Source: U. S. Department of the Treasury, Internal Revenue Service.

The basic problem has been an overemphasis in the U. S. on the physical life of facilities and, as a result, U. S. tax rules have been formulated based on the concept of "useful life". Since the Congress has viewed steel industry facilities as having long "useful lives", the American steel industry has been burdened with low capital recovery allowances. Most nations, however, have not employed "useful life" or physical concepts but rather have used rapid capital recovery as an economic tool to promote accelerated capital formation and increased productivity. For example, in some countries, capital expenditures are treated as any other expenditures and can be deducted in the year incurred. In France, Italy, and Sweden, capital recovery allowances in the first 3 years exceed 75% of capital expenditures (as compared to less than 57% in the U. S.). In Canada, full capital recovery is permitted in approximately 2-1/2 years, compared with over 10 years in the U. S. Various estimates indicate that this more rapid capital recovery in Canada would lead to a return on investment at least a third higher for a plant built on the north shore of Lake Erie as compared to one built on the south shore in the U. S. (50 miles away). This in part explains why The Steel Company of Canada, Ltd., has a fully integrated plant under construction on the north shore of Lake Erie at Nanticoke, Ontario, while U. S. Steel Corporation cannot justify expenditures for a similar plant on the south shore. Such comparisons dramatize the importance of rapid capital recovery if the American industry is to compete on equal terms with foreign rivals.

2. Investment Tax Credit

Funds provided by the investment tax credit contribute to the capital available to the American steel industry for investment in productive facilities. The credit also partially offsets the inflationary effects of deferred recovery of capital investment. The credit, obviously, is of greatest benefit to capital-intensive industries such as steel, where the need for investment capital is largest.

The investment tax credit should be made fully available as expenditures are incurred and should apply to all property, rather than just property having a normal construction period of two years or more. Further, the annual limitation on the utilization of the credit (which is presently scheduled to increase to 90% in 1982) should be eliminated completely, and the credit should be fully available to offset all tax liability including the minimum tax. The impact of this structural change on tax revenues would be minimal. However, there would be a maximum utilization of the benefit in years when capital expenditures are at the highest levels and funds are most needed.

3. U. S. Corporate Tax Rates

High corporate tax rates constrain enterprise expansion by reducing net income and reinvested earnings. Further, in current circumstances, where capital recovery is not sufficiently rapid and companies are often forced to use reinvested earnings as a supplement to maintain plant and equipment, high corporate tax rates impose severe penalties.

Most other countries have much lower corporate tax rates than the U.S.A. As estimated by the Canadian Department of Finance, effective corporate tax rates on manufacturers' book profits are 10 percen-

[1] **Chemical Engineering** Plant Cost Index, May 8, 1978.

tage points lower in Canada than in the U. S. for representative states and provinces. (For example, the effective income tax rate for all manufacturing in Ohio, including both state and federal tax, was estimated at 41.3%. This rate compares with 31.9% in the province of Ontario.)

One special feature of U. S. tax law that unfairly reduces internal cash generation is the minimum tax on items of tax preference. Designed to ensure the payment of at least some taxes on income, the minimum tax was intended to remedy abuses that clearly were not of corporate origin. Too often the relationship between tax preference items and a company's ordinary tax liability generates an unexpected minimum tax liability. This occurs when net income levels are depressed while tax preference items remain at or near normal levels. This was not the intention of Congress and there is no justification for the continued application of the minimum tax to corporations. The law should be repealed or amended to remedy this mis-application.

4. Depletion

The percentage depletion allowance for minerals has provided an effective economic benefit to the extractive industries. It should be retained at least at current levels. Furthermore, the effectiveness of this provision should not be impaired by the minimum tax, particularly since the tax laws on percentage depletion contain a direct limitation on such deductions.

5. Impact of Current U. S. Tax Provisions

In summary, current U. S. tax laws are not designed to enhance capital recovery. This imposes an unnecessary burden on U. S. corporations attempting to compete with other world industries. In addition, by discouraging capital expenditures, specifically capital replacement, the lower rate of capital recovery in the U. S. slows improvements in labor productivity, energy efficiency, pollution control, etc. — all of which are made possible by installing technologically up-to-date equipment. Current capital cost recovery in the U. S. is slower than that of most of its trading partners. This slow capital recovery goes a long way towards explaining the declining U. S. international competitive position in recent years. Faster capital recovery is essential if the U. S. is to re-establish itself as a viable competitor in the world economy.

D. The Tax Law Change That America Needs Most

The American steel industry strongly needs legislation that would divorce capital recovery from the useful or physical life concept and provide much faster capital recovery than is possible under current legislation. As will be demonstrated below, without such changes the American steel industry may not be in a position to make the dramatic increase in capital expenditures that is essential.

At this writing, two bills titled "The Capital Cost Recovery Act of 1979" (H.R. 4646 and S. 1435) are being considered. These bills embody many of the features that American steel companies consider essential. They provide for more rapid recovery of capital investment made in productive assets after December 31, 1979; they eliminate the concept of recovery over the useful life of the assets.

The proposed bills would establish three classes of capital investment, each having a different capital cost recovery period:

Class I	Ten years — generally applicable to all investment in buildings and structural components of buildings.
Class II	Five years — generally applicable to investment in all machinery and equipment, except for Class III.
Class III	Three years — applicable to investment in automobiles and light-duty trucks, to the extent of the first $100,000 of investment in each year.

A transition feature has been included to keep the revenue impact in early years at acceptable levels. It phases in the new program over five years for the five— and ten—year groups. The three-year class will have no transition period.

The bill does not change the rules governing the character of property eligible for the investment tax credit. It does, however, change the eligibility to coincide with the new recovery periods. A full 10% credit is provided for eligible property in the five- and ten-year classes and 6% for the three-year class. Proportionate recapture is provided if the property is not held for the applicable recovery period.

The effect on the American steel industry can be illustrated by a comparison of capital recovery allowances on investment made from 1974 through 1978 under current law and the proposed bill. During that period, $14 billion was invested in plant and equipment. Using the shortest lives and fastest capital recovery available under tax laws in effect during the period, the industry could have recovered $4.0 billion, or 29% of that investment by the end of 1978. If the proposed bill had been fully available, the industry would have been permitted to recover $9.5 billion, or 68% of the investment. If the five-year period coincided with the phase-in period, recovery could have been $6.5 billion, or 46% of the investment.

The effect can also be illustrated by comparing the proposed capital recovery with present capital recovery, assuming an annual investment of $100. As shown in Table VII-2, the cumulative recovery of capital after five years of the proposed system (68% of total investment) would be double that of the present system (35% of total investment).

If enacted, this legislation would contribute to making the American steel industry more competitive financially with foreign steel industries. From the standpoint of the total economy, enactment of this legislation would help to mitigate the effects of inflation in two important ways: First, by encouraging business investment in modern equip-

ment, the capacity of the country to produce more goods more efficiently would expand the supply side of the economy, thereby reducing the inflationary effects of capacity shortages. Second, allowing the recovery of the capital cost over a shorter period would avoid the erosion of investment brought on by inflation, which is particularly severe in a longer-term recovery period.

TABLE VII-2

Proposed Capital Cost Recovery Period Would be Much Faster than Present Capital Recovery Allowances

Year	Investment	Cumulative Recovery of New Investment*	
		Present Capital Recovery Allowances	Proposed Capital Cost Recovery
First	$100	$ 8.3	$ 20.0
Second	100	23.6	52.0
Third	100	36.9	76.0
Fourth	100	48.9	92.0
Fifth	100	59.6	100.0
5-Yr. Total	$500	$177.3	$340.0
% of Investment		35%	68%

* Assumes half year convention.

Source: American Iron and Steel Institute.

E. Meeting Future Capital Needs

The major sources of funds potentially available to the American steel industry for meeting its capital requirements are: capital recovery (depreciation); reinvested earnings (net income less dividends); and issuance of long-term debt and capital stock.

1. Capital Expenditures and Capital Recovery (Depreciation)

Chart VII-1 illustrates a possible phasing in of capital expenditures from 1979 through 2003, a period corresponding to the 25-year period required under Scenario I to completely replace current facilities of the American steel industry. Chart VII-1 also shows, under current tax law, the year-to-year capital recovery (tax basis) in 1978 dollars resulting from the capital expenditures shown. As illustrated, assuming no inflation, in the initial years of the revitalization effort sizeable gaps exist between capital expenditures and capital recovery. Not until 1989 does capital recovery catch up to then-declining capital expenditures; and for the whole 1979-2003 period, there would be an annual capital shortfall of $0.7 billion (1978 $). However, with inflation — even moderate inflation (5% per year) by today's standards — real capital recovery (1978 $) always falls short of capital expenditures.[2] The higher the rate of inflation, the larger the capital shortfall.

The gap between capital recovery and capital expenditures under current tax law is largest at the beginning of the revitalization program, as is clearly shown by Chart VII-1. For example, assuming no inflation and constant (1978) dollars, there would be a gap of $3.6 billion in 1984. With 5% inflation the real 1984 capital shortfall is $4.2 billion. The size of these initial shortfalls, occurring at the very time the revitalization effort would be just getting started, and when no cost-reduction benefits would have yet been realized, would seriously jeopardize the whole revitalization program.

The steel industry requires much more rapid capital recovery. However, to fully utilize faster rates of capital recovery, simultaneous improvements in rates of return, from current levels, are essential. With measures that make possible earnings sufficient to permit full use of enhanced capital recovery allowances, the proposed Capital Cost Recovery Act (CCRA) of 1979 would go a long way in the direction of providing the more rapid capital recovery required. Chart VII-2 illustrates potential capital recovery (tax basis) under the proposed Act. Assuming no inflation, there are still shortfalls in the early years of the industry's revitalization program (assuming the CCRA phased in beginning 1981), but these shortfalls are quickly recovered. For example the largest shortfall is $2.1 billion in 1983 (assuming no inflation), but this is made up by 1986. However, with inflation — even moderate inflation — the proposed CCRA does not quite permit full capital recovery in constant dollars. As shown in Chart VII-2, with 5% inflation the larger shortfalls in the initial years of the program would not be offset by capital recouped. The higher the rate of inflation, the larger the real capital recovery shortfall. Nevertheless, the impact of inflation on real (1978 $) capital recovery is much less under the proposed CCRA than under current law because the recovery period is much shorter. For example, with 5% inflation, the average annual real (1978 $) capital shortfall (1979-2003) under CCRA would be only $.4 billion as compared to $1.6 billion under current tax law.

While potential capital recovery under the proposed CCRA is inadequate in inflationary circumstances, and is not in line with that of Canada and elsewhere, it is clearly superior to that made possible by current laws. The proposed CCRA is thus a major step in the right direction.

2. External Sources of Capital

Considering that capital shortfalls occur under both tax law and the proposed CCRA, is there any way this shortfall could be covered by increased debt or issuance of additional capital stock?

a. Long-Term Debt

The current debt/equity ratio in the steel industry is 42%, much higher than the 33% average for all manufacturing. Rather than

[2] Use of constant dollars obviates the necessity to estimate future cost and price trends. However, because of the lag between capital expenditures and capital recovery, use of 1978 dollars does not eliminate the adverse impact of inflation on capital recovery. With inflation, actual capital recovered (which is based on historic capital equipment costs) buys less equipment than that originally purchased. The higher the inflation, the smaller the real capital recovery.

Chart VII-1

With Current Tax Laws, Capital Recovery Shortfalls Imperil Steel's Revitalization Effort

Billions of 1978 dollars

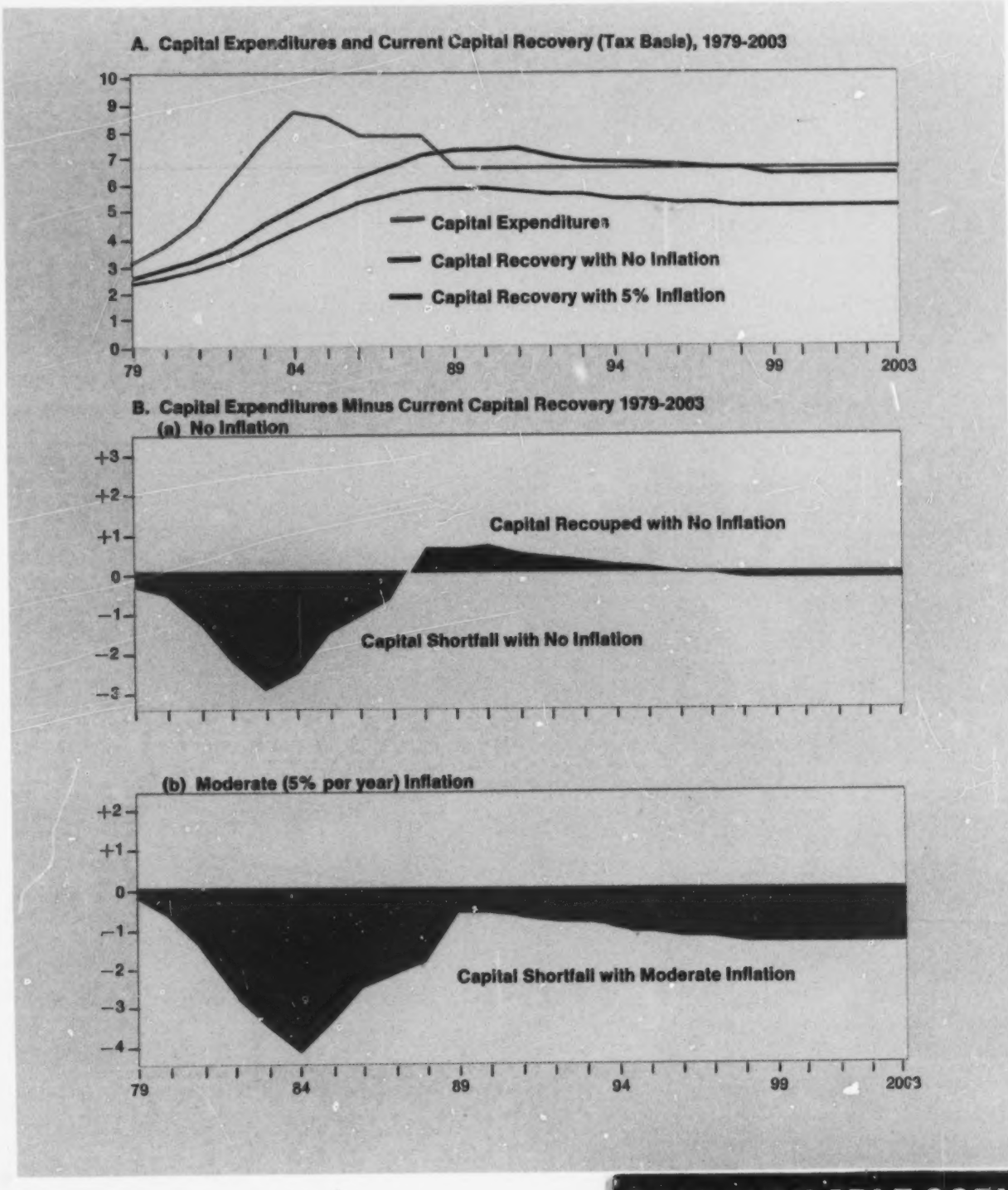

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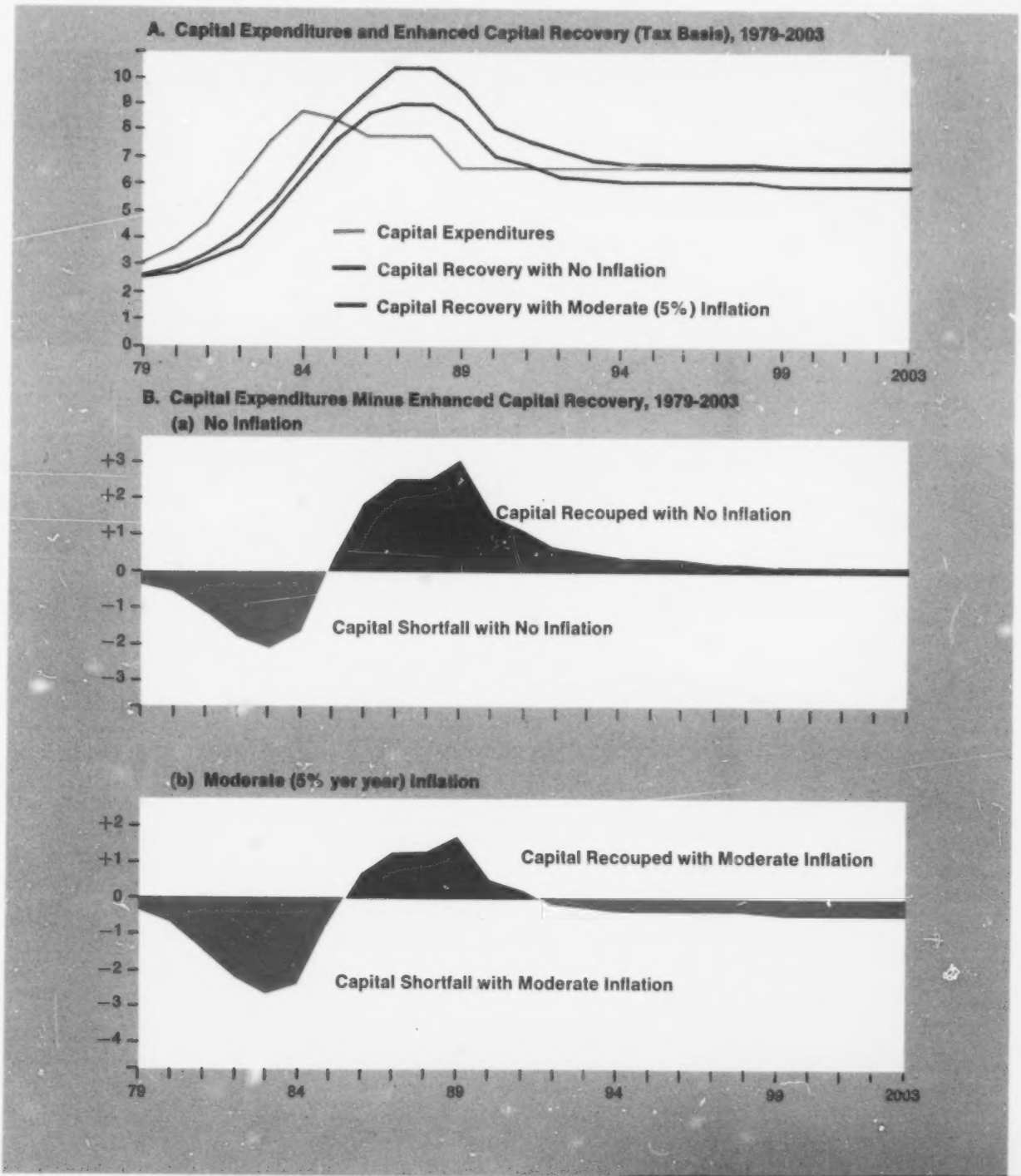
Chart VII-2

With More Rapid Capital Recovery, Capital Shortfalls May Not Curtail Steel's Revitalization Effort

Billions of 1978 dollars



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increase the current debt/equity ratio, a cyclical industry such as steel should endeavor to reduce it to at least the all-manufacturing average. Borrowing to offset debt retirement might be possible, but increased borrowing beyond the current levels must be treated as an uncertain source of funds, at least in the initial years of the industry's revitalization effort.

b. *Issuance of Additional Capital Stock*
During the past 10 years, the issuance of common and preferred stock has been an insignificant source of funds for the American steel industry. If the revitalization of the industry occurs and rates of return improve, stock financing for expansion could be more attractive. However, it is impossible at this point to predict that the issuance of additional capital stock will contribute anything meaningful to the expansion capital required by the industry, particularly in view of the extent of the disparity between book value and market value of the various companies' stock.

3. *Reinvested Earnings: The Necessity for Improved Rates of Return*

American steel companies cannot finance the capital expenditures needed to modernize, given current rates of return and tax law. While this shortfall would be significantly reduced if an improved capital cost recovery bill such as CCRA is enacted into law, a shortfall would still exist. At the same time, the industry must improve its earnings to avail itself of the full benefits of CCRA.

Reinvested earnings hold promise as a source of funds to cover capital shortfalls, if return on equity increases to levels commensurate with that of all manufacturing. One major result of the hoped-for revitalization effort will be significant cost decreases — by the time the 25-year revitalization effort is complete, the efficiency improvements inherent in this effort would reduce operating costs by over 30% and total costs by approximately 15%.Thus, all other things remaining the same, net income should rise considerably.[3] The difficulty, however, is that, since the cost savings due to efficiency improvements will not be immediate, the resulting increased net income, and thus potential increases in reinvested earnings, will lag the capital expenditure outlay by several years.

The early years of the revitalization effort could thus see sizable capital shortfalls, with little hope that improved retained earnings made possible by cost reducing efficiency improvements, will bridge the gap. Estimates indicate that, under Scenario I, an increase in revenue per ton, in real terms, sufficient to attain a rate of return commensurate with the average for all manufacturing, would increase cash flow enough so that, combined with more rapid capital cost recovery, the expected cash shortfalls would be offset.

Given the cost savings anticipated from improved efficiencies under Scenario I, such increases in revenue per ton could be reversed beginning in the late-1980s as efficiency improvements accumulate.[4] At the completion of the revitalization effort, under CCRA, even with potential real revenue per ton decreases (depending on the rate of inflation)[5] the cost savings (in 1978 $) resulting from improved efficiencies would be sufficient to provide a rate of return approximating that of all manufacturing.

Accordingly, the American steel industry would be in a position to continue to supply at least 85-90% of the American steel market requirements at a cost low enough to make economy-minded U. S. consumers choose American steel products.

Estimates also indicate that more rapid capital recovery, in addition to making the revitalization effort possible, would tend to result in much higher rates of return and greater price benefits for consumers than would be the case with the same efficiency improvements but with existing capital recovery provisions. These greater benefits for consumers and producers, result from a lowered need for reliance on debt (hence reduced interest costs) and reinvested earnings. Thus, tax law changes to accelerate capital recovery are inherently anti-inflationary.

In summary, more rapid capital recovery is absolutely essential for the revitalization and modernization of the American steel industry. However, unless real revenue increases sufficiently, in the early years, to generate competitive rates of return in the steel industry, more rapid capital recovery allowances will be of limited value, and cash short falls will remain. These initial higher real revenue increases would eventually be reversed as a result of greater efficiencies. This could result in rates of return for steel in line with that for all manufacturing while at the same time giving customers the benefit of much lower prices than would otherwise be the case.

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[3] All references to future prices and costs are in terms of 1978 dollars. This implicitly assumes that any nominal unit input cost increases are passed through to nominal product prices.

[4] Price increases or decreases are all real (1978 $) price changes made possible by real (1978 $) cost changes resulting from changes in operational efficiency. A real price decrease may be taking place while nominal prices are rising. In nominal (current) dollar terms, real (1978 $) steel price increases mean steel prices rising relative to an all-product average, and real (1978 $) price decreases mean steel prices decreasing relative to an all-product average.

[5] The impact of inflation on real revenue (all prices and costs in 1978 dollars) results from the fact that due to delayed capital recovery, real capital recovery is less with more rapid inflation. This necessitates greater use of retained earnings (and thus higher returns) to finance given capital expenditures. The lower the rate of inflation, the larger the real revenue decreases theoretically possible. The higher the rate of inflation, the lower the real revenue decreases theoretically possible — indeed, at very high rates of inflation, no real revenue decreases may occur.

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VIII The U. S. Should Support an Open World Trade System, But Ensure Its Fairness to All Nations

. . . A sound U.S. trade policy for steel must incorporate seven essential elements: prompt and full enforcement of U.S. trade laws; continued use of trigger price data monitoring for steel imports; conclusion of an effective international safeguards code; full development of the OECD steel committee; coherent steel trade policies toward developing countries; a policy for trading with centrally planned economies; and an equitable commodity trade policy.

The American steel industry supports an open world trade system for steel. It does so in the knowledge that it is the low-cost producer (compared with its major foreign competitors) for the American market, but also recognizing that imports can help supply this market during periods of peak demand. It follows that U. S. trade policy for steel in the 1980s must be viewed in the perspective of steel developments world-wide.

The outlook for steel trade in the next decade is characterized by (i) uncertainty as to steel demand and, especially, supply; (ii) the existence of a new and as-yet unproven set of U. S. and international trade rules designed to ensure fair trade; and (iii) uncertainty as to the industrial — especially steel industry — policies of governments throughout the world.

This general uncertainty is increased by the growth of the developing countries' share of world steel demand and supply as well as the future role of the USSR, People's Republic of China, and other centrally planned economies in international steel trade.

A recent Organization for Economic Cooperation and Development (OECD) report, resulting from a three-year study, concluded that almost all long-term forecasts of steel consumption show two trends:

- In the long term, rates of growth in demand will be lower than in recent years.
- The main consumers will still be the developed OECD countries and the centrally-planned economies, but their share will fall from 85/90% to 65/70% by the end of the century.[1]

The report continues, ". . . in a context of slower growth, industrial competition between the developed countries will become keener, and all the more so if industrial products from East European countries and a part of the Third World come on to the world market. This situation will not make it easier to co-ordinate counter-cyclical policies or to frame compatible adjustment policies."[2]

Under these circumstances, and given the long history of disruption of the American steel market by dumped and otherwise unfairly priced imports, U. S. trade policy for steel in the 1980s must be carefully shaped, and shaped at the highest level of government. It must deal with long-range developments fundamental to achieving, ultimately, an open world trade system, but it must be flexible enough to meet the exigencies of world trade conditions at any one time.

Specifically, in the industry's view, a long-term steel trade policy must contain all of the following elements.

A. Prompt, Effective Enforcement of U. S. Trade Laws

A major reformulation of trade policy has just been completed. The Tokyo Round multilateral trade negotiations were conducted with over 100 countries under the auspices of the General Agreement on Tariffs and Trade (GATT) having as a primary objective the expansion of international trade. Those negotiations resulted in enactment of the Trade Agreements Act of 1979, which was supported by the domestic steel industry.

Expansion of trade, however, must proceed on an equitable basis. In most foreign steel-producing countries the steel industries are instruments of national economic and social policy. Steel has been exported at almost any price in order to maintain employment and obtain favorable trade balances. To a large extent these exports have been subsidized or dumped into the U. S. market — the largest and virtually the only open market in the world.

In supporting passage of the Trade Agreements

[1] Organization for Economic Cooperation and Development, **Interfutures: Facing the Future,** 1979, p. 369.

[2] **Ibid.,** p. 375.

Act of 1979, the steel industry viewed the legislation as providing clearer standards against which dumping, subsidization, and other forms of unfair international trade practices could be judged.

> Enactment of the trade bill by Congress will provide the tools for more effective action against unfair trade practices, but those tools will only be as good as the will of our trade officials to utilize them. The true benefit of the trade bill provisions, therefore, will depend on the enforcement of them by the Government.[3]

The enforcement process is one of both interpretation and administration. *Interpretation* of the revised trade statutes by federal agencies should scrupulously reflect the Congressional intent that injurious dumping and importing of subsidized steel be effectively stamped out, and that appropriate offsetting duties be levied when violations occur. If it becomes clear that Congressional intent is not being honored, Congress should promptly further amend the laws to achieve proper enforcement.

As to *administration*, the problem is to implement the enforcement system that has been put in place. The Executive Branch trade reorganization plan shifts the responsibilities for implementation of the antidumping and countervailing duty statutes from the Department of the Treasury to the Department of Commerce. Policy oversight will rest in the Office of the U. S. Trade Representative. These transfers of responsibility will not solve the enforcement problem if trade law enforcement is subordinated to political pressures.

In summary, as a result of the recent revisions to the U. S. trade laws, U. S. government agencies administering those laws now have the necessary statutory authority to provide prompt and full relief from unfair trade practices. All that is required is the political will to do so. The steel industry for its part will carefully monitor and keep Congress apprised of the course of proceedings under the revised statutes and under the Executive Branch trade reorganization plan.

B. Continued Use of TPM As Adjunct to Trade Law Enforcement

The Trigger Price Mechanism (TPM) was established in 1978 to facilitate enforcement of U. S. antidumping law. Its principal features are (i) a system of monitoring and analyzing steel imports to facilitate detection of possible dumping; and (ii) use of "self-initiated" investigations by government when the monitoring system signals the possibility of dumping in a particular case.

Although authority for government self-initiation of cases involving unfair trade practices is provided in U. S. trade law, it has seldom been used in the past. The result has been great difficulty in addressing widespread dumping over several product lines through the product-specific petition procedure initiated by individual companies. The TPM, which covers a broad array of steel mill products, is an innovative attempt to help deal with wholesale dumping.

In order for the TPM to accomplish its original purpose, however, a fundamental flaw must be corrected. The TPM is supposedly based on Japanese steelmaking costs, as calculated by the Treasury, assuming the Japanese to be the lowest-cost foreign steel producers. Unfortunately, this procedure provides an "umbrella" to less-efficient, high-cost producers (e.g., European producers) and legitimatizes dumping by them. Therefore, in calculating those crucial Japanese steelmaking costs, U. S. officials should more accurately reflect the full costs of production in Japan. They should devise other improvements in the TPM to ameliorate the problem of continued dumping by European and other non-Japanese producers.

In addition, the TPM should be reconstructed to monitor home market prices, as well as costs, in order to disclose instances of dumping in the classic sense of price discrimination.

Finally, the TPM should be modified to include specialty steels.

There have been two positive results from the institution of the TPM that deserve comment. First, the TPM data-gathering and analysis system is the first comprehensive effort of its kind to monitor steel imports on the basis of customs invoices. As such, the data-gathering and analysis system should be perfected and continued with a view to becoming a permanent trade policy tool to be employed whenever domestic industries are faced with wholesale dumping of imports.

Second, the TPM imposes on the U. S. government an obligation to self-initiate investigations whenever dumping is thought to be occurring, an obligation that Congress intended but which has not been fulfilled under the antidumping law.

The TPM needs substantial changes from its present form. Only with major revisions can the TPM become an effective trade law enforcement instrument.

C. Establishment of an Effective International Safeguards Code

Development of an international safeguards code was on the agenda for the Tokyo Round multilateral trade negotiations. Regretfully, agreement on such a code has not yet been achieved.

The domestic steel industry hopes that efforts to revise GATT Article XIX into a meaningful international safeguard or "escape clause" procedure will continue undaunted. The United States already has in place a well-established domestic safeguard procedure. An international safeguards code could provide two benefits that would extend beyond the

[3] Lewis W. Foy, Press Releasc, American Iron and Steel Institute, June 20, 1979. See also Industry Sector Advisory Committee (ISAC) No. 11 **Steel Sector Report on Multilateral Trade Negotiations,** June 28, 1979.

domestic procedure: (i) it could permit application of selective import restrictions so that import restraints could be confined to countries deemed to be causing the import problem; and (ii) it would require other nations to be more transparent and to operate above-board whenever they apply import restraints or enter into restrictive trade agreements that can have the effect of diverting steel into the United States.

In advocating an international safeguards code, the United States should press strongly for official notification to GATT of all the safeguard measures that are currently in effect (e.g., the still unofficial European-Japanese agreement on steel). A priority task should be the drawing up of a full and complete catalogue of such trade restrictive measures.

D. Full Use of the OECD Steel Committee

Another vehicle for addressing international steel trade problems is the OECD. This is the longest-established and most important international organization in which the major industrialized nations seek to cooperate in economic matters. A Steel Committee of the OECD was formed in October, 1978. The creation of this inter-governmental body is viewed as a significant and potentially beneficial step toward the resolution of steel trade problems.

This is particularly important for the United States, since the OECD Steel Committee groups together the governments of the most developed of the Free World's steel producers, who face many common problems as mature industries.

In order to be effective, however, the Steel Committee must not become bogged down in endless procedural or theoretical disputes, or in prolonged studies of an academic nature. Rather, the Committee should: (i) closely monitor trends and development in international steel trade and world supply-demand balances; (ii) be alert to signals of impending changes in trade flows that could cause disruption in one or more major markets; and (iii) foster and promote government policies that will maintain profitable and economically viable steel industries to serve the world's markets.

It should therefore be an integral part of American steel trade policy to develop the analytical and consultative capabilities of the OECD Steel Committee to their full potential.

By the same token, developing nations should be encouraged to join in the Steel Committee's work so that they, as expanding producers, are brought within the ambit of international dialogue which affects their future as well as the future of OECD member countries.

A recent report of the Trilateral Commission suggested that it is essential for the OECD Steel Committee experiment to succeed in imparting a high level of international understanding on steel:

> Otherwise new friction is bound to arise which could create political as well as economic difficulties among the industrialized countries — and with the newly industrializing countries as well, as they expand their steel production for home and for export. The proper prescription may again be consultation and information, but more formal agreements will have to be considered.[4]

E. Formulation of a Coherent Steel Trade Policy Vis-a-Vis Developing Countries

United States relations with developing countries in regard to steel involve several factors, all of which must be taken into account in formulating steel trade policy.

Developing countries represent large and generally growing markets for U. S. capital goods, including steelmaking equipment and related services, as well as other indirect steel exports. They are also markets for American steel mill products; a large part of the 2.5 million tons exported in 1978 from the United States went to such countries. It is also true that several developing countries have raw materials, domestic markets, and industrial bases sufficient to justify installation of domestic steel capacity.

The American steel industry urges that U. S. trade policy continue to foster industrial development in developing countries, but that stress be placed on responsible international behavior in terms of trade. Attention should focus on four areas.

First, steel producers in developing countries are generally subsidized directly or indirectly by their national governments (see Appendix A). U. S. trade policy must therefore aim at bringing developing countries into full compliance with the GATT Subsidy/Countervailing Duty Code. Where developing countries' steel capacity is world-scale, utilizing the most modern technology and equipment, and internationally competitive in every sense of the word — and this is almost invariably the case — there is no justification for relieving the governments of those countries (who are usually also the owners of the facilities) from full compliance with Code obligations.

This point of view was recently expressed in a report by the Secretary-General of the OECD wherein the newly industrializing countries were urged to begin combining the dismantling of their tariff and non-tariff trade barriers "with early moves towards a gradual phasing out of export subsidies."[5] The domestic steel industry recommends that this admonition apply not only to export subsidies but also to so-called internal subsidies when internationally competitive industries are involved.

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[4] The Trilaterial Commission, **Industrial Policy and the International Economy**, 1979, p. 60.

[5] Report by the Secretary General, **The Impact of the Newly Industrializing Countries on Production and Trade in Manufactures**, 1979, p. 16 and 17.

Second, developing countries often install steelmaking facilities with a capacity far in excess of the needs of national markets. Surplus production is often dumped in the markets of developed countries; the United States is one of the most open markets for the entry of dumped steel. Enforcement of the antidumping and countervailing duty laws with their improved provisions will therefore take on increased importance as developing countries increase their productive capabilities.

Third, given the fact that most developing countries producing steel have highly modern, competitive steel industries, there is no justification for waiving import duties on their steel mill products entering the U. S. market. The domestic industry urges that the Generalized System of Preferences continue to exclude steel mill products from coverage on the basis that such products are "import sensitive" under the provisions of section 503 of the Trade Act of 1974.

Fourth, international cooperation is required to curb subsidized sales of steelmaking equipment to developing countries. U. S. steelmakers themselves profit by sales of steel to domestic firms that export steelmaking equipment; there is no desire, obviously, to impede such sales. But, in the opinion of the industry, the showering of capital at subsidized rates and terms permits developing countries to bring on stream steelmaking capability that is not economically justifiable, and so further aggravate the world steel industry's problems.

The industry has accordingly urged the U. S. government to take the initiative in moving the governments of Japan, the European Community, and other OECD member countries to evolve a common approach aimed at halting predatory government-subsidized export credits as they apply to construction of steel plants and equipment.

F. A Policy for Steel Trade with Centrally Planned Economies

Trade with centrally planned economies can constitute an important and growing share of world trade, benefitting all parties. Liberalization of trade with appropriate safeguards is to be welcomed.

The expansion of U. S. exports of steel and steel-intensive goods to non-market economies offers potentially large benefits for domestic steel producers, other industries and the economy generally. Such exports should not be impeded by laws and regulations designed to further U. S. political objectives unrelated to economic or *essential* national security considerations.

At the same time, however, trade with centrally planned economies poses special problems: the absence of a market economy basis (price mechanism) to evaluate true costs and so measure accurately any element of dumping or subsidization; and the extraordinarily complex and time-consuming nature of negotiations with governments in such economies in order to redress injury.

As trade expands, problems will require more accurate and intense analysis, such as identification and measurement of subsidies or subsidy-equivalents. This is a task of immense technical complexity, requiring continuous, large-scale analysis. The cost of such analysis, if carried out in the depth and with the continuity it deserves, is beyond the scope of a single industry. Federal agencies charged with responsibility for overall trade policy should establish an ongoing data-gathering and analytical effort in this area.

The results of an ongoing analytical capability of the kind proposed above would benefit U. S. trade knowledge generally and would not be limited to our trade relations with the COMECON countries[6] and other planned economies.

G. Commodity Trade Policy

The dependence of the American steel industry on various raw materials ranges from near self-sufficiency in coal and ferrous scrap, to partial dependence on imported iron ore, to near-total dependence on imported nickel, chromium, and tin. The long-term outlook is for even greater reliance on foreign sources of raw materials.

As the mineral requirements of the American steel industry rise, so do the requirements of the rest of the world. Developing countries, anxious to add more value to their exportable commodities and to reduce dependence on imported materials, are establishing steel industries that consume a portion of the domestic minerals previously available for export. It is estimated that world consumption of raw materials used in steelmaking is increasing two and a half times as fast as U. S. consumption of such materials.

Clearly, during the 1980s the American steel industry will encounter intensified competition in the world market and in its own domestic market for materials needed in steelmaking. A competitive domestic steel industry will require access to adequate and reasonably priced supplies of imported and domestic materials. As discussed more fully in Chapter X, a nation should first be able to satisfy domestic demand for raw materials. Thereafter, such materials should be made available to the world market on a most-favored-nation (non-discriminatory) basis.

* * *

The above enumeration of requirements for a sound U. S. trade policy for steel for the longer term does not preclude the possible need for interim measures pursuant to domestic laws and international agreements. These shorter-term measures may be necessary to deal with imminent conditions of serious market disruption that impede adjustment to changes occurring in competitive conditions in the domestic market.

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[6] European Communist nations, members of Council for Mutual Economic Assistance.

As discussed in Chapters V through VII, revitalization of the domestic steel industry will, according to Scenario I, take a 25-year effort, with the initial phase beginning immediately. During the first five to eight years, there will be substantial capital outlays, but most of the benefits — in terms of improved productivity, increased energy efficiency, etc. — will not be realized until after the initial phase is completed. Therefore, during these early years the domestic steel industry will be especially vulnerable to market disruptions that could impede its generation of capital, even with policy improvements in the capital recovery and environmental areas. Unless the government provides firm assurances against such market disruptions (either by excessive volumes or unfair pricing), companies in the American steel industry may not be in a financial position to pursue a soundly based revitalization effort.

Temporary, short-term measures to cope with serious market disruption need not be part of a long-term trade policy, but can help re-establish a satisfactory business environment for steel while long-term trade policy is evolving.

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IX Revitalization of the Steel Industry Will Significantly Reduce Its Energy Requirements

. . . The integrated steel industry is a very heavy user of energy. It accounts for 4 - 5% of total domestic energy consumption. More than two-thirds of steel's energy consumption is derived from coal. Energy requirements per ton of steel product have been reduced 28% since 1950. But, the cost of energy has grown more than six-fold since then. Modernization of steel facilities offers the potential for substantial energy savings. America's future energy needs may not be met unless government policies are dramatically changed.

A. The Steel Industry's Demand for Energy

The integrated steel industry is involved in extracting, separating, and upgrading minerals from the earth and marketing the finished products. In this total value-adding system, large quantities of energy are used in the extraction process, transporting raw materials, and distributing the final products. More than 90% of the energy required in the total process, however, is required within the boundaries of steelmaking plants.

The steelmaking, shaping, and treating processes are inherently energy-intensive. Large quantities of thermal energy are required to separate the ultimately useful iron from the oxides and various impurities that occur in the natural state. After the iron reduction or smelting process, additional quantities of energy are required in refining, shaping, and treating the steel to produce the many desired shapes and final product specifications.

During the 1972-78 period, the steel industry required 4.2% of all direct U.S. energy consumption, as shown in Table IX-1. The energy consumption data shown in this table are summaries of the thermal equivalents of all forms of energy inputs entering steel plants. If, in addition, electric powerplant conversion losses are allocated to the steel industry for its purchased electric power, the steel industry accounted for 4.6% of the nation's total energy consumption during the 1972-78 period.

B. Energy Supply In the Integrated Steel Industry

The steel industry energy supply components are summarized in Table IX-2 for each year of the 1972-78 period. As shown, more than two-thirds of the energy consumed by the steel industry is derived from coal, about 20% from natural gas, about 8% from petroleum products and about 5% from purchased electricity.

The sources of energy for the steel industry, compared with sources of total domestic energy consumption, are shown in Table IX-3.

Although coal at 67.5% is the largest energy source, the other components are crucial in balancing out the total energy demand and in specific ap-

TABLE IX-1

The American Steel Industry Accounted for 4 to 5% Of the Nation's Total Energy Consumption

Year	Consumption (Quadrillion Btu) Steel Industry	Total Domestic	Steel Industry As % of Total Domestic Economy
1972	3.13	71.63	4.4%
1973	3.45	74.61	4.6
1974	3.42	72.76	4.7
1975	2.94	70.71	4.2
1976	3.05	74.51	4.1
1977	2.91	76.54	3.8
1978	2.98	78.15	3.8
TOTAL	21.88	518.91	4.2%

Sources: American Iron and Steel Institute, **Annual Statistical Report**; U.S. Department of Energy, **Monthly Energy Review**.

TABLE IX-2

More Than Two-Thirds of Steel's Energy Consumption is from Coal

Percent From Each Source

Source of Energy	1972	1973	1974	1975	1976	1977	1978	Annual Average
Coking Coal	64.0%	64.5%	62.1%	66.8%	65.7%	62.4%	56.3%	63.1%
Other Coal	3.5	3.4	2.9	2.6	2.4	2.9	2.4	2.9
Outside Coke	1.3	1.7	2.8	(1.5)	(0.9)	0.9	5.8	1.5
SUBTOTAL FROM COAL	68.8	69.6	67.8	67.9	67.2	66.2	64.5	67.5
Natural Gas	20.7	19.0	20.0	20.0	19.9	19.9	20.5	20.0
Petroleum	6.2	6.9	7.6	7.3	7.8	8.6	9.4	7.6
Liquid Petroleum Gas	—	—	—	0.1	0.1	0.1	0.1	0.1
Purchased Electricity	4.3	4.5	4.6	4.7	5.0	5.2	5.5	4.8
TOTAL	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Source: American Iron and Steel Institute, **Annual Statistical Report.**

plications where coal derivatives are either unavailable or not suitable. In a fully integrated plant, the contribution of coal will likely exceed the average percent contribution shown in Tables IX-2 and IX-3, but in a non-integrated plant the direct contribution of coal might be zero.

TABLE IX-3

The Mix of Steel's Energy Sources Is Quite Different from the Rest of the Economy

Energy Source	Total Domestic 1978	Steel Industry 1972-78 Average Direct	Steel Industry 1972-78 Average Adjusted
Coal	18.2%	67.5%	69.6%
Natural Gas	25.3	20.0	20.8
Petroleum	48.6	7.7	8.5
Nuclear	3.8	—	0.4
Hydro & Other	4.1	—	0.7
Electricity	*	4.8	*
Total	100.0%	100.0%	100.0%

* Included in sources above. The adjusted mix for the steel industry distributes the 4.8% purchased electricity to the primary fuels in proportion to primary fuels consumed by the electric utility industry during the 1972-1978 period.

Source: American Iron and Steel Institute, **Annual Statistical Report;** U. S. Department of Energy, **Monthly Energy Review.**

1. Coal

Metallurgical (coking) coal and coke accounted for 64.6% of the energy input for the American steel industry during the period 1972-78. Direct coal uses other than for metallurgical purposes comprise about 2.9% of total industry energy requirements, principally for steam generation.

Metallurgical coal requires properties peculiar to its specific use. It must be a coking coal; it must not exhibit swelling characteristics of such pressures as to damage the refractory ovens or stick to the oven walls; the coke product must be highly stable and low in impurities, ash, and sulfur, to maintain competitive and efficient blast furnace performance.

Thus, the feed for producing blast furnace coke is a precisely selected mix of washed coals, the supply of which is limited to a relatively low percentage of large total domestic coal resources. During the last decade, the quality of coal mixes available has exhibited a significant deterioration; average coal ash and sulfur contents have increased, imposing additional energy requirements for fluxing the impurities and offsetting some of the energy savings in other areas. Battelle Columbus Laboratories estimated the 1972-80 increase in energy requirements due to higher ash and sulfur at 0.53 million Btu per ton of finished steel production (about 1.8% of 1978 consumption rates).[1]

Many other factors during the last decade contributed to metallurgical coal supply problems, which were reflected in higher prices and short supplies. A major one has been the enforcement of mine safety laws. The net effect has been a decline in output from approximately 16 tons per man-day in 1969 to about 8 tons per man-day in 1978. Second, environmental constraints on utilities and industries burning higher sulfur coal indirectly generated a market for the higher grade, lower-sulfur metallurgical coal for steam generation in competition with steel industry needs. These factors, along with higher-cost labor, inflated capital cost for new capacity, and strikes in the coal industry resulted in a significant increasing cost trend and periods of supply shortfalls. The market price of metallurgical coal since 1972 has approximately tripled to about $45/ton in 1978.

2. Coke

The steel industry during the 1972-78 period consumed an average of 53.9 million tons per year of blast furnace coke, while shipping an average of 95.9 million tons of steel product per year. The industry produced an average of 52.1 million tons per year over the same period, with the balance of 1.8

[1] Battelle Columbus Laboratories, **Development and Establishment of Energy Efficiency Improvement Targets for Primary Metal Industries; SIC 33** Vol. I, p III-22 to Federal Energy Administration, August 13, 1976.

million tons per year being purchased from outside sources (domestic and foreign).

During 1978, coke consumption of 52.1 million tons exceeded production (45.1 million tons) by 7.0 million tons. It was not possible to compensate for this shortfall by withdrawal from inventory or by domestic purchases. Consequently, an estimated 5.3 million tons, 10% of requirements, were imported. This was made possible only because foreign producers had built large coke inventories during the 1975-77 period of depressed world steel markets.

Not only did the imported coke adversely affect the U.S. balance of payments by some $500 million, but there was also a loss of by-product fuels from the coke that would otherwise have been produced by the domestic industry in 1978. This loss of by-product fuels resulted in increased consumption of natural gas and fuel oil equivalent to 6-8 million barrels of crude oil.

The coke consumption/production gap in 1978 was partly attributable to the 1977-78 coal strike. More important, however, coke production capability exhibited a significant decline during the last decade. Reduced production rates were required on most of the existing batteries to comply with environmental control requirements, and in many cases older facilities were forced out of production without new replacement capacity coming on stream. During the last decade the capital cost of constructing an optimum-sized coke battery (about 1 million tons per year capacity) increased from $30-40 million to $150-200 million. This quantum jump was caused by increasing costs of materials, construction labor, and environmental control requirements.

Another significant coke problem is that the deteriorating coal quality, higher ash, higher sulfur, and poorer coking quality are reflected in the properties of furnace coke. Long-term sources of quality coals, or alternative technologies, are serious concerns in maintaining a competitive steel industry. For many years the integrated steel companies have spent millions of dollars on research into the various properties of individual coals and toward developing optimum coal blends for furnace coke production. Research is continuing toward development of technologies for producing quality coke from low-quality coals. Pretreating, including preheating, has been one step toward this end.

Other research efforts have been under way for some time to produce formed coke ("formcoke") and coal chemicals as co-products from non-coking coals. This effort was begun many years ago by the private sector; the Department of Energy is now participating in this activity. Although highly capital-intensive, the formed coke route appears to be an environmentally acceptable technology for the utilization of non-coking, low-quality coals to produce metallurgical coke and chemical feedstocks as co-products.

3. Natural Gas and Fuel Oil

Natural gas and fuel oil are combined here because of the large degree of interchangeability between the two. The two combined provide the balancing energy for the large supply of by-product fuels in integrated plants, and they represent important fuel sources for non-integrated plants.

Over the 1972-78 period, natural gas and fuel oil accounted for an average of 27.6% of the industry's energy input—20% natural gas and 7.6% fuel oil.

Since 1974, natural gas consumption by American steel companies has been about 600 trillion Btu per year, about 10% less than average annual consumption for 1972-74. Although lower steel production was responsible for some of this decline, availability also declined; there was an increase in consumption of fuel oil as an alternative fuel. Natural gas curtailments increased significantly since 1974, and numerous conversions to oil firing (which require considerable capital expenditures) were made to avoid losses of jobs and steel production. There were also problems with oil availability and deliveries during severe winter weather, but apparently no serious plant shutdowns occurred. Fortunately, most of the supply problems arose during non-peak steel markets. Otherwise, the impact could have been more damaging.

The biggest problems with natural gas and fuel oil have been rising costs and erratic availability. Natural gas prices to the steel industry increased from an average of about $.50 per million Btu in 1972 to $2.18 per million Btu in 1979, a four-fold increase. Similarly, the average industry price of residual fuel oil in the United States increased from $.10 per gallon in 1972 to an average of $.54 in mid-1979, a five-fold increase.

Because of the outlook for supply capability from domestic resources and the provisions of the National Energy Act of 1978, future supplies might be further constrained and prices could be even higher. Conversions from oil and natural gas to coal, as required under the Fuels Use Act, will add to the industry's capital requirement.

4. Electric Power

The steel industry purchased 48.2 billion kilowatt hours of electricity in 1978—2.4% of total power sales in the United States. Additionally, the steel industry generated 9.3 billion kilowatt hours in 1978, or 16% of total electricity consumed in steel plants. Although the direct thermal equivalent of purchased electricity was only 5.5% of total thermal energy input to the steel industry during 1978, it might be considered the most critical energy component because of the lack of alternative energy sources.

Although power interruptions are to be expected in unusual situations, the most serious problem has been increasing costs which, per kilowatt hour, have about tripled since 1972. Reliability of future power supply is another serious concern. Siting, licensing, capital availability, and regulatory problems continue to plague the utility industry. Supplies could

become critically short in some geographical locations during the next few years. Higher construction costs, long lead times, and rising fuel costs will drive electric power prices up at a faster rate than inflation.

C. Opportunities for Energy Conservation In the Integrated Steel Industry

Energy consumption expressed as Btu per ton of finished steel shipped has decreased from about 43 million to about 31 million per ton of steel product during the 1950-1978 period (based on gross energy input unadjusted for coal chemical credits). Energy consumption in 1978 adjusted for sundry credits and changes in steel inventory was 29.9 million Btu per ton of finished steel production. The overall reduction of 28% equates to a compound annual savings rate of about 0.9%. These savings are attributable to overall improvements in various process technologies.

There have been numerous assessments of the steel industry energy savings potential during the last few years, following the national emphasis on energy conservation. Battelle Columbus Laboratories prepared at least three pertinent reports for the Department of Energy (DOE), and there have been numerous other studies performed for the DOE on this subject.

On various occasions, executives of steel companies have publicly indicated that if some of the oldest steel plants were replaced with modern facilities, energy savings per unit of finished product would be about 35% — or the equivalent of close to 200 million barrels of crude oil annually. Realization of this potential will require that steel production facilities be totally upgraded to the best available technology. This would require an extensive and complex program of facility improvement and replacement, retrofitting in some cases, individual process improvement in other cases, and complete plant replacement in still other cases.

Completely new plants that provide the opportunity for optimizing plant layout, material flows, and energy-efficient processes are the best prospects for energy savings. However, the very high cost of totally new plants and the characteristics of phased market and plant developments lead toward perpetuation of existing plants. Therefore, it is unrealistic to expect that the fully assessed potential will be totally realized at any specific point in time. Inadequate capital availability is a serious barrier to energy conservation in the steel industry.

Other than the regular day-to-day housekeeping efforts to maintain status quo with possible minimal savings, energy conservation projects require significant capital investments. These investments must compete with capital needs for other objectives such as environmental control, replacement and/or modernization of existing facilities, health and safety of the work force, and new capacity. Regular replacement and improvements of existing facilities will bring about some associated energy savings, but expenditures on conservation projects *per se* without an appropriate benefit-to-cost relationship would be inefficient use of capital.

In addition to unavailability of capital, various other factors will affect the actual realization of energy savings:

1. The demand for steel products and the resulting operating rates: low production levels are less energy-efficient due to more frequent cycling and "holding hot" situations, as compared with high-level, steady-rate production.
2. The quality of raw materials: the quality of metallurgical coal is decreasing and more energy will be required to flux the additional impurities.
3. Energy requirements for meeting environmental standards: several years ago, Battelle Columbus Laboratories concluded that the then-existing environmental control requirements in steel plants accounted for about 2% of total energy consumption and this could increase to 7% by 1983.[2]
4. The National Energy Act, comprising five component acts and adding five more to the long list of Federal energy acronyms: PIFUA, PURPA, ETA, NECPA, and NGPA. This legislation and the proposed implementing rules are so comprehensive and complex that any assessment of total impact at this time is impossible.

In summary, the ultimate realization of energy savings and the rate of improvement will be a resultant of all of the many factors reviewed above. Governmental forces, policies, and attitudes, both direct and indirect, will be large factors in the ultimate determination of energy conservation results.

D. The Appropriate Role of Government In Energy Policy Setting

Government is responsible for the formulation of national policies and for instilling a sense of national purpose among the populace. In energy matters, however, the government's role for many years has been essentially counter-productive. Regulations, controls, and social constraints have discouraged exploration, development, and production of domestic energy supplies. Artificially distorted pricing structures have encouraged the maintenance of less efficient industrial facilities and have encouraged wasteful use of energy in other sectors. Resulting disincentives have perpetuated a domestic steel industry that, on balance, is significantly lagging in the most modern energy-efficient technology. This is due to economic forces, not to a lack of vision or perspective on the part of the industry.

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[2] Battelle Columbus Laboratories, **Final Report on Potential for Energy Conservation in the Steel Industry**, May 30, 1975.

1. Research and Development

The Federal government should support a strong energy R&D program based, to the maximum extent, on private sector responsibility for actual project performance.

Government assistance is essential when needed R&D programs would involve time horizons too distant, capital investments too large, or risks too great to justify private sector initiative. Such assistance should be provided through the stage when prospects for successful development pose normal commercial risks, at which stage market forces should be allowed to function.

The most significant potential for conservation of energy in steel is associated with process and facility modernization such as modern blast furnaces, basic oxygen steelmaking, continuous casting, and modern steam cycles. Typically, research and commercialization in these areas, along with the many other process and product developments, have been performed and financially supported by the private sector. Thus, appropriate public policy is to maintain a competitive free market environment within which industry is motivated and financially able to continually upgrade its facilities and continue its historic research effort into even more energy-efficient technologies.

Recently the Federal government joined the steel industry in support of the ongoing research effort toward developing a process for producing furnace coke and coal chemicals from non-coking grade coals. Further government support in this area could speed the development and implementation of technologies that could facilitate the use of the country's large, lower-quality coal resources, rather than depending entirely on limited supplies of higher-quality coal and increasingly scarce sources of gaseous and liquid hydrocarbons.

2. Environmental Law Problems

Implementation of the Clean Air and Clean Water Acts has placed many serious burdens on the steel industry. Present standards are largely based on inconclusive evidence of the need for such stringent limits and without heed to the technical and economic capability and the additional nonproductive energy required to comply with the standards. At some level of increasing control requirements, the overall benefits resulting from environmental improvements are offset by the penalties exacted by such controls.

Beyond the additional energy required for environmental control facilities, environmental constraints have unduly limited the steel industry's large and efficient coal utilization process — coke production. Operating facilities have been forced to reduce coke production, and other production units have been forced to shut down prematurely, without commensurate new capacity coming on stream. This has placed an added demand on the nation's oil and gas supplies.

The appropriate role of the Federal government is to establish standards for the environment that balance total costs against benefits. Those standards must recognize the time required to effect results, and must be compatible with national goals of employment, economic growth, and national security — all requiring adequate energy supplies.

3. The National Energy Act

The realization of declining capability of domestic petroleum and natural gas supplies in the early 1970s, followed by various disruptions in foreign supplies, stimulated an unprecedented number of energy studies, reports, legislation, and implementing rules and regulations.

Since 1973, numerous energy-related statutes have been directed toward reducing the consumption growth rate of petroleum and natural gas through conservation, and through substituting coal and other resources for oil and natural gas. In addition to various other measures, the five acts passed in November 1978 (referred to collectively as the National Energy Act) reinforce these prior thrusts.

The effects of the National Energy Act of 1978 will be challenging, especially in the next two or three years. It is obvious that this Act will have a significant impact on corporate manpower, since legislative requirements mandate that voluminous information be furnished to the Department of Energy. Much of this information is considered by individual companies to be proprietary (e.g., the cost of producing coal; details on coal reserves, quantities, and costs of fuels consumed at various locations; and economic evaluations of various alternatives for major fuel-burning installations). It appears that much of this material is not needed for the DOE to do its job.

In conclusion, future energy costs will be higher, shortages might be experienced, and additional paperwork and manpower will be substantial. More important, the National Energy Act further limits the freedom to make business decisions, and the resulting regulatory conflicts and delays could have a paralyzing impact on the national economy. Also, the Act does not provide adequate incentive to invest in new process facilities of modern technology, such as continuous casting, since the Act provides tax credits only for retrofitting to improve energy use efficiency. Conflicts appear imminent between the DOE prohibitions against burning natural gas or petroleum on the one hand and the EPA implementation plans on the other. It should be well known by the government agencies that coal cannot be substituted for natural gas firing without some degradation of the environment. Thus, instead of "pinching" industry between the agencies in protracted argument and litigation, the appropriate role of government is to immediately recognize the areas of conflict and shortcomings and establish appropriate trade-offs that are in the nation's best interest.

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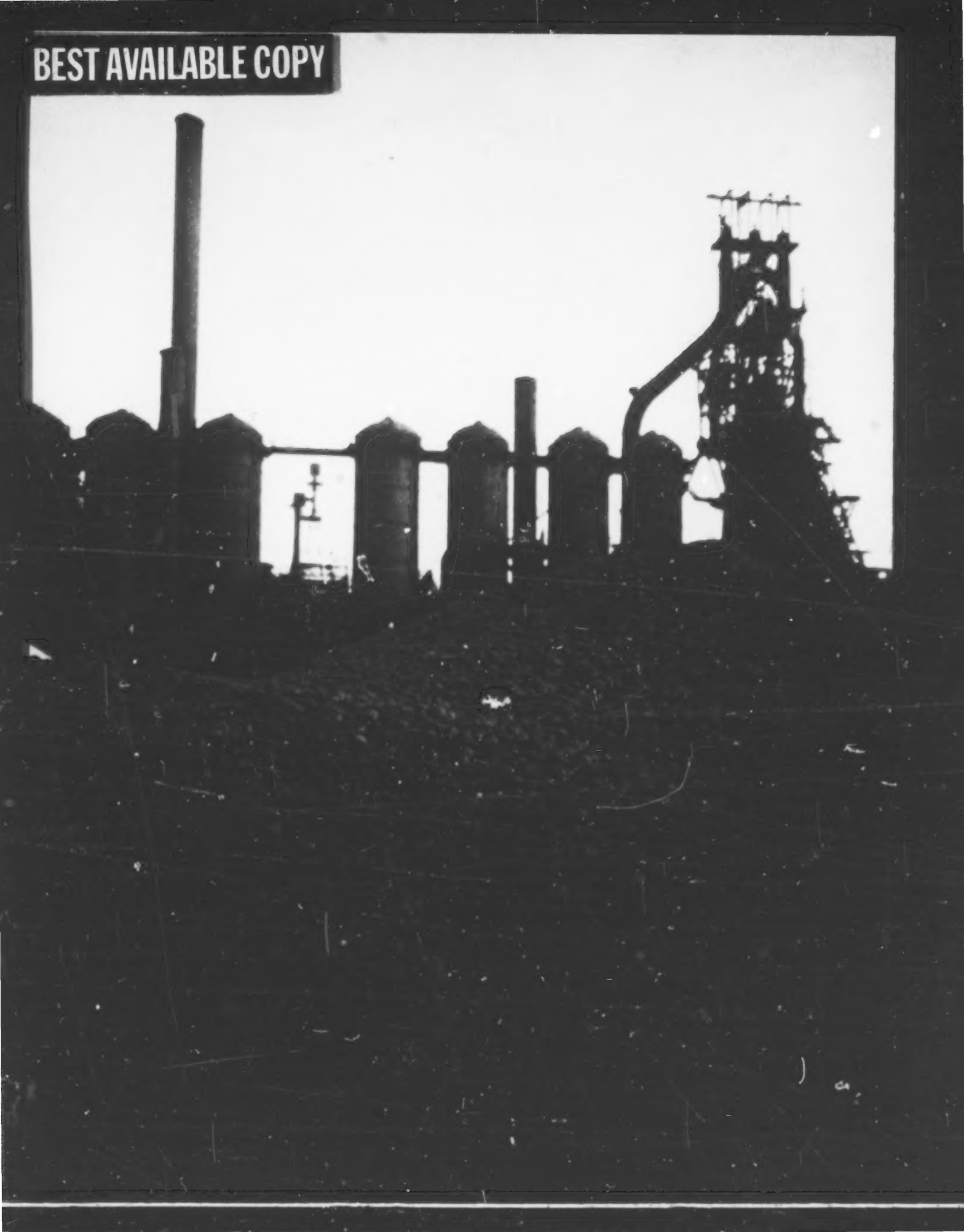

X Market Forces Should Determine The Allocation of Raw Materials

. . . Many raw materials essential for making steel must, of necessity, be imported. Continuous access to foreign supplies of raw materials is in the best interest of both the steel industry and the nation. Once any nation's demand for its own raw materials has been satisfied, its raw materials should be made available to others in the world through market forces rather than government edicts.

While this nation has ample reserves of iron ore, coal, limestone, and steel scrap, and is a major net exporter of coal and steel scrap, other critical materials must be imported. Either domestic reserves or domestic production of these raw materials is insufficient.

As Table X-1 indicates, the U. S. depends heavily on imports for critical materials used in steelmaking.

TABLE X-1

U. S. Depends Heavily on Imports For Critical Materials

Material	1978 Dependence (%)
Columbium	100%
Manganese	98
Cobalt	97*
Chromium	92*
Fluorine	82
Tin	81*
Nickel	77
Zinc	62
Tungsten	50

*Dependence on imports is actually understated since insignificant quantities of these materials are mined domestically. Domestic production is limited to recovery of secondary materials (through recycling).

Source: U. S. Department of the Interior

Continuous access to foreign supplies of certain vital raw materials is therefore crucial to the domestic steel industry. Such access warrants increased attention, as developing countries attempt to improve their trade positions through commodity agreements, cartels, and other actions that interfere with the free interplay of market forces.

A. Commodity Agreements

American steel companies support arrangements, multi-lateral or sectoral, that increase the orderly, equitable flow of raw materials in international trade. Such arrangements, however, should not include provisions for stabilizing prices through such devices as price indexation or buffer stocks. These types of mechanisms lead to misallocations of resources; furthermore, they often do not work.

An example of the problems that can occur with departure from free market conditions is the Fifth International Tin Agreement. Tin is used for plating steel which is subsequently fabricated into metallic containers. Virtually all primary tin must be imported into this country, since domestic resources are negligible. In 1976, the U. S. reversed its policy and joined the Fifth International Tin Agreement. Under this accord, producers and consumers (each having equal voting strength) attempt to regulate prices through a system of export controls and a buffer stock.

These devices have not been effective, especially in controlling price increases. With the resources of the buffer stock depleted, there is currently no way to moderate price increases through tin sales. Furthermore, the agreement has not encouraged needed expansion of supplies.

Over the long run, tin-producing countries would be better off if prices were allowed to fluctuate freely. During periods of high demand, producing countries could use the premiums collected on sales to provide the financial resources for new investment. During market downturns, countries could use traditional international financial institutions such as the International Monetary Fund to deal with any short-term balance of payments problems that occur.

B. Economic Sanctions

Until recently sanctions against Zimbabwe-Rhodesia prevented the U.S. from importing chromium from that country, and chromium is a material on which the U.S. is almost totally dependent on imports. Chromium is used by the steel industry primarily in the production of stainless steel. Over 97% of the world's chromium reserves are located in South Africa and Zimbabwe-Rhodesia.

Paradoxically, the nations that gained the most from the U.S. embargo were the Soviet Union and South Africa. While the U.S. may not totally subscribe to the politics of any of these countries, the fact is that they are the primary sources of chromium, and we do not have the option of choosing not to trade with them. One must question the consistency and rationality of policy, that excluded

imports from Zimbabwe-Rhodesia for the very reasons that could have been used to exclude such imports from the alternative suppliers—South Africa and the Soviet Union.

C. Access to Supply

Once any nation's domestic demand for a raw material has been satisfied, such material should be made freely available on the world market on a nondiscriminatory basis. While this principle has gained wide acceptance in foreign countries, the U.S. has adhered fairly rigidly to the principle of unrestricted access to its raw materials. As a result, during periods of peak demand for certain commodities, domestic shortages have occurred that could have been alleviated if such materials had been made available domestically, i.e., in place of export opportunities. The foreign markets developed by domestic businesses should not be denied them, but neither should foreign countries be allowed to drain critical resources from the U.S. at the expense of domestic industries, and ultimately contrary to the best interests of the U.S.

1. Ferrous Scrap

The supply of scrap that is available to the steel industry is limited by many factors. During peak periods of domestic and foreign iron and steel production, scrap supplies become tight. A high level of foreign demand for U.S. scrap, superimposed on high domestic demand, causes significant upward pressure on scrap prices and has an inflationary effect on steel industry costs. Furthermore, it does little to bring forth additional scrap supplies during the short run. In 1973-1974, for instance, supplies of steel scrap increased only 7% for every 100% increase in ferrous scrap prices.

To relieve the upward pressure on scrap prices caused by excessive exports during 1973 and 1974, the U.S. government imposed export controls. Unfortunately, the effectiveness of this action was diminished by the delay in imposing the controls.

In view of the importance of scrap to the steel industry and the U.S. economy, the U.S. should monitor scrap exports on a continuous basis. It can no longer be assumed that the U.S. can supply a growing world need for scrap, while the rest of the world controls its internal supplies.

This position on the allocation of scarce raw materials is further validated by the longer-term outlook for scrap supply and demand. Growth in scrap consumption is expected to continue both in the U.S. and abroad in the 1980s. Domestic demand will rise significantly faster in the 1980s than was the case in the 1960s and 1970s, due primarily to the faster rate of growth in electric furnace capacity. By the end of the 1980s, when electric furnace production is expected to account for over 30% of raw steel production (versus 24% in 1978) the U.S. will no longer be able to supply its total scrap needs during peak periods of steel production. Similarly, growth in steel production abroad and greater reliance on electric furnaces is expected to increase foreign demand for scrap.

The reasons behind the relatively rapid development of electric furnace capacity are not difficult to surmise. At one-third to one-half the costs of integrated facilities, scrap-based electric furnaces represent a feasible economic alternative to companies or countries building or expanding steelmaking capacity. In addition, the extra energy required to produce pig iron, together with the environmental impact of a full complement of facilities, makes nonintegrated mills an even more attractive investment to producers who must comply with increasingly restrictive environmental and safety standards. It is doubtful that the economics of steelmaking will shift enough during the 1980s to reverse this trend toward greater electric furnace production.

2. Molybdenum

Molybdenum is used, primarily by the steel industry, in the production of high-strength, heat-resistant steel alloys and stainless steels. The U.S., which accounted for approximately 60% of world production in 1978, exports over half of what it mines. A world shortage of this material has led domestic producers to allocate existing supplies to foreign and domestic customers, even as demand for the material has increased. As a consequence of the shortage, domestic companies have been forced to purchase needed material on a spot market at prices up to five times greater than that being charged by domestic molybdenum producers.

Since the world shortage in molybdenum supply is expected to continue through the mid-1980s, the U.S. should exercise its authority under the Export Administration Act of 1969 to assure that U.S. needs are met before domestic output is exported.

XI The Nation's Environmental and Industrial Health Policies Must Fully Recognize Economic Realities

. . . Environmental and industrial health demands have become major cost factors for many industries including steel. Federal and state environmental laws often have been enacted without balancing costs and benefits. Because of the inherent nature of the steel production process, these laws have led to very sizeable capital expenditures and have significantly increased annual operating costs. Even higher costs face the industry in the future . . . occupational safety and health programs need to be reviewed and revised in terms of costs incurred versus benefits realized. Standards should permit flexibility for implementation. Proposed standards should be based on demonstrated need. Enforcement procedures need to be improved to minimize the burdensome impact of OSHA regulations.

A. Environmental Matters

From 1951 through 1978, the steel industry invested $3.7 billion ($6 billion in constant 1978 $) for environmental control facilities. The consulting firm of Arthur D. Little, Inc. estimated that compliance with long-term air and water regulations for existing plant and equipment will require capital expenditures of at least $600 million per year through 1985 for a total of $4 billion. This amount does not include cost estimates for either the requirement of zero discharge of water pollutants or for post 1985 air standards. Although detailed estimates of the cost of meeting these latter requirements are not currently available, order of magnitude estimates indicate that an additional $3 billion may be required. Thus total environmental control expenditures for the next decade may reach $7 billion or an average of $700 million per year.

In view of the very large capital expenditure requirements for compliance with environmental regulations, the industry is seeking a more cost-effective means of achieving environmental quality control and a relaxation of those mandated requirements that have not been scientifically proven to be necessary to a healthy environment. The following principles are recommended to accomplish these objectives:

Principle #1: Upon the implementation of the 1982 air program and the 1984 water program, no further controls should be required except where they can be demonstrated to be cost-effective.

Principle #2: All emission sources and effluent discharges (both public and private) should be brought to a uniform level of control before any segment of industry is required to go beyond those levels needed to protect public health.

Principle #3: A reassessment of all requirements should be conducted before embarking on a further round of control technology beyond that needed to protect public health.

These principles apply for both the short and long term. In addition to these principles much can be done before 1982 to lessen the industry's current environmental dilemma. Among the short-term changes that can and should be made are the following:

1. *Recommended Short-Term Changes*
   a. *Revision of the National Ambient Air Quality Standard for Total Suspended Particulate.*

The National Ambient Air Quality Standards (NAAQS) are the basis for essentially all of the regulatory programs under the Clean Air Act. They are the basis for State Implementation Plans (SIPs), for designation of Non-attainment Areas, for requirements for State Implementation Plan revisions, and for other regulations. The NAAQS for particulate matter is of particular importance to the steel industry since particulates represent the largest quantity of pollutants discharged by the steel industry. Steel companies believe that the NAAQS for particulate matter is significantly more stringent than the law requires. Revision is essential. Although industry representatives have discussed this matter

with the EPA on many occasions and have started a legal action to require EPA to revise the criteria on which the standard is based, EPA has moved very slowly toward a revision of the particulate criteria. Unless EPA moves speedily on this matter, the industry might be started on a major round of capital spending that may well prove unnecessary when the standard is modified, as steel companies believe it should be.

b. The "Bubble" Concept.

Present regulatory procedures comprise specific emission limitations for each process source and require that these limitations be met on a source-by-source basis. Under the bubble concept, the total of the individual source emission limitations set by these regulations would be calculated for a given plant and set as an overall emission limitation for the plant. The plant could then apply the most cost-effective techniques of emission or effluent controls on a case-by-case basis to achieve plant-wide environmental improvement equivalent to that required by the individual source regulations, but at a lower cost and with greater reliability. This "bubble" concept of plant-wide emission or effluent limitations should be broadly applicable to many types of air and water pollution control. EPA has recently issued a policy statement indicating that "bubble" can be applied in certain air pollution control programs.

c. "Limited Life Facilities".

A special regulatory approach should be adopted for "limited life facilities". A number of older facilities in the steel industry are only marginally economic to operate and their limited life expectancy cannot justify any significant capital expenditure, but they could continue to provide some jobs and productive capacity. Imposition of stringent environmental control requirements can only force premature shutdown, with accompanying employment disruptions and community distress. The EPA should establish a mechanism whereby a facility would be able to request a special classification as "limited life". When such a classification is established, the facility should be subject to only limited environmental regulations for a specified period of time.

d. Opacity and Fugitive Emission Regulations.

Many of the regulations included in State Implementation Plans (SIPs), particularly those controlling visible emissions, opacity, and fugitive emissions, are primarily "cosmetic" and have little relation to attainment of air quality standards. These requirements impose high costs on industry with no corresponding return in environmental quality. Except where they can be demonstrated to affect air quality, existing opacity and fugitive emission regulations should be excluded from revised SIPs. Where opacity regulations are incorporated in SIPs, explicit alternate opacity limits equivalent to mass emission limitations should be established. It is essential that EPA issue guidance to the states directing that these changes be made in the implementation plans.

e. Replacement in Kind.

Under current EPA regulations, reconstruction of production facilities or replacement in kind is classified as a "new source". As such, it is required to achieve levels of emission control much more stringent than those for existing facilities, and is subject to complex "new source" review procedures. These requirements are counterproductive and are actually disincentives to modernization. EPA should issue regulations stating that replacement of facilities in kind with no increase of rated capacity or allowable emissions should not be classed as "construction of new sources". Such a policy change would encourage modernization of facilities.

f. Water Quality Standards.

The Clean Water Act (the Federal Water Pollution Control Act of 1972, amended in 1977) includes a goal that ultimately all navigable waters be made fishable/swimable. Current EPA programs and state programs under EPA guidance are directed at immediate achievement of the fishable/swimable standard. This imposes requirements beyond the intent of the Clean Water Act. Water use designations should be realistic and should represent "current best usage" considering all current and reasonably attainable conditions. EPA should promptly provide guidance to the states on the latitude they have in setting water quality standards and in setting timetables for water quality standards compatible with the technology-based requirements on industry.

g. Compliance Dates and Penalties.

EPA's current enforcement program under the Clean Air Act calls for renegotiation of existing compliance schedules and imposition of heavy penalty payments. This is counterproductive and disruptive to an orderly program to clean up as rapidly as practicable within the capabilities of industry. EPA should recognize that existing orders and agreements generally represent the most realistic levels of control that can be achieved and the fastest practicable schedules within the constraints of engineering and financial capabilities of the companies. EPA should impose only mandatory penalties — and those at the minimum mandated amounts, with maximum credit for alternative environmentally desirable expenditures.

h. Water Effluent Limitation Guidelines.

EPA is required under the Clean Water Act to develop effluent limitation guidelines for the steel industry that will represent the best available technology for control of toxic effluents. These effluent guidelines will be the basis for future water discharge permits and will set the requirements for water treatment facilities. It is essential that EPA's development of these guidelines be directed only at control of real toxicity problems and not incorporate expensive technology for which there is no

demonstrated need.

i. Solid Waste Disposal.

Under the Resource Conservation and Recovery Act (RCRA), EPA is required to develop regulations covering the disposal of hazardous wastes. Drafts of these regulations indicate a far-reaching regulatory program that will classify a wide variety of wastes as "hazardous" and then require complex and expensive disposal procedures, with no consideration being given to the real hazards involved with specific wastes. It is essential that these regulations be made realistic so that only those wastes that present real hazards are classified as hazardous and so that hazardous waste disposal practices are consistent with the hazards of specific wastes.

j. Deferral of Air Requirements.

Under the Clean Air Act, states were required to have revised their implementation plans by July 1, 1979, and promptly to implement those revisions to meet current National Ambient Air Quality Standards. At the same time, however, the law requires that the criteria on which the standards are based be reviewed and that the standards be revised as appropriate. Since steel companies believe that standards should be revised to be less stringent (see item 1 above), these prompt revisions to implementation plans may require significant unnecessary expenditures. The requirements for revision of implementation plans should be deferred until the standards have been properly updated, and time for compliance with revised SIPs should be deferred accordingly.

2. *Recommended Longer Term Changes*

Over the longer term, consideration should be given to legislative changes in the following areas:

a. Clean Air Act.

Changes should be made in the Clean Air Act (as amended in 1977) to minimize, postpone, or eliminate requirements based on secondary air quality standards that are related to welfare — not health. All welfare-related requirements should, at a minimum, be subject to rigorous cost-benefit analyses and local options. Requirements for prevention of significant deteriorations (PSD) should also be reviewed by the Congress.

b. Clean Water Act.

Changes should be made in the Clean Water Act to eliminate the mandatory requirement that all streams must be fishable and swimable and to eliminate the goal of zero discharge of pollutants. Local authorities should be authorized to designate appropriate uses for stream segments. Criteria and effluent standards for toxic pollutants should be reasonable values based on sound scientific data, taking into account the appropriate best usage of water. Variances for effluent limitation guidelines should be permitted for both conventional and toxic pollutants, based on a showing that water quality required to protect these best uses of local waters will be achieved. Effluent limitation guidelines should be set strictly on the basis of protection of human health, and water quality requirements should be directed at the protection of realistically designated water uses for stream segments.

c. Solid Waste Disposal.

Solid waste disposal regulations under the Resource Conservation and Recovery Act (RCRA), principally directed at protection of water quality, should be consistent with the approach to water quality set forth above. Hazardous waste disposal requirements under RCRA should be directed at protection of the environment from specific hazards involved and should not be so broad as to impose arbitrary requirements upon many industrial disposal practices.

d. Penalties.

Legislative changes to alleviate the impact of non-compliance penalties should also be considered by the Congress.

B. Occupational Safety and Health

During the next decade efforts should continue to improve workplace safety and health. These efforts, however, must recognize the reality that achieving success hinges on the availability of and the competing demands on limited resources. Improper allocation will have an adverse impact on productivity and on the industry's international competitiveness, because the required resources are not insignificant. For example, surveys made by AISI with regard to industrial health standards for noise, lead, sulfur dioxide, benzene, and carcinogens, indicate that at least $100 million per year will be necessary to comply with these requirements.

All proposed standards, regulations, and policies should be evaluated to determine their societal benefits as well as costs in terms of productivity, personnel, time, and capital to minimize the current trend toward lengthy and costly litigation resulting from OSHA's failure to do so. Regulations must consider the problems of retrofitting existing equipment. OSHA should undertake a systematic identification of hazards for which engineering controls can be implemented on scheduled equipment-replacement cycles.

In addition, provisions for standards should be performance— or goal—oriented to allow flexibility for implementation and to encourage alternatives for compliance to achieve the intent of the standards in a cost-efficient manner. OSHA should discontinue its practice of improperly elevating engineering and work practice control to a position of priority over the use of personal protective devices. By establishing this priority, OSHA has deprived employers of desirable flexibility in determining the most appropriate method of complying.

The principal parties should be allowed to provide meaningful input in developing regulations so that agreement is reached in principle on their

necessity and on realistic timetables. Any proposed standard should be based on a demonstrated need and should include explicit objectives by which the effectiveness can be measured and the need to continue the standard can be determined.

From a safety standpoint, the consensus standards were not based on cost effectiveness. A 1976 study of the American Enterprise Institute for Public Policy Research found that "the OSHA standards are so unrelated to the major causes of occupational injury that even perfect compliance would have a limited effect on injuries."[1]

Legislative efforts should be pursued to enact legislation containing principles similar to those contained in President Carter's Executive Order 12044. This Order recognized the need to consider meaningful alternatives before issuing regulations in order to reduce compliance costs, paperwork, and other burdens on the public. In his Regulatory Reform Message, President Carter proposed to make new regulations more efficient by legislation requiring agencies to identify alternative means of accomplishing the objective, to calculate the costs and benefits of each alternative, and to select the least costly method.

Additionally, to avoid unnecessary regulation and waste of irrecoverable resources, new and revised standards must reflect a clear need for increased employee protection. OSHA must realize that overall improvement of occupational safety and health in the workplace can only be accomplished through the effective use of scarce resources.

OSHA must also recognize the economic feasibility issues during rulemaking and in compliance inspections. To date, their failure to do so has required the Occupational Safety and Health Review Commission and the courts to determine and clarify, on a case-by-case basis, the issues of technical and economic feasibility of controls. In addition, the frequent and arbitrarily established employee and environmental monitoring required by health standards (including "action levels") squanders scarce resources and does not demonstrably benefit employee health. Determining the need for and scheduling the frequency of monitoring should be left to the judgment of the professionals who are familiar with the operations and the processes.

Better coordination between OSHA and other regulatory bodies is required. OSHA's requirement for specific engineering controls and work practices, such as established in the coke oven standard, has created significant difficulties. From a practical standpoint, engineering or work practice controls have caused decreased productivity and have resulted in potential violations of either environmental agency consent agreements or other OSHA standards.

Improved enforcement procedures are essential to minimize the unnecessarily burdensome impact of OSHA. The statutory provisions that provide for civil and/or criminal sanctions have had a negative impact on the manner in which the compliance officer is viewed by an employer. Rather than being viewed as a safety or health professional who can be called upon to help resolve pertinent problems, the compliance officer is viewed as a quasi-policeman who is to cite violations and impose penalties rather than assist in the reduction of hazards. The Interagency Task Force recommended that OSHA set priorities designed to provide more cost-effective enforcement by concentrating enforcement resources on establishments with high rates of lost workday injuries; concentrating on reducing injuries rather than on citations and compliance procedures; making hazard control standards more flexible; and removing financial incentives for delaying tactics.

OSHA's complaint inspection policy is a cause of even more serious concern. OSHA makes more complaint inspections than any other type of inspection. Such inspections provide limited benefit in protecting workers from serious hazards. The General Accounting Office reported that in 80% of the complaints reviewed, inspectors found no violations of any OSHA standards that were related to the complaint.

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[1] American Enterprise Institute for Public Policy Research, **Occupational Safety and Health Act: Its Goals and Its Achievements**, January 1976, p 2.

XII Market Forces Should Establish The Level of Steel Prices

. . . Many years of governmental constraints on steel prices have impaired the ability of the industry to finance investment in modern, cost-efficient facilities. Artificial constraints on steel prices are counterproductive to the national objective of reducing inflation because they restrain capital formation. Non-market constraints on steel prices must not continue. Otherwise, the result will be increasing dependence upon foreign sources of steel. An adequate supply of steel could become a critical national concern—similar to the present energy problem resulting from excessive dependence on foreign oil.

As demonstrated in Chapter VII, a critical element of the solution to the steel industry's problem of capital formation is improved profitability. Improved profitability can and must provide a source of additional funds for modernization and expansion; concurrently, the prospects of such improvements in profitability will provide additional incentive for capital expenditures by steel companies.

Profit is simply the difference between selling price and cost. Any artificial constraints on steel prices, accompanied by upward pressures on steelmaking costs, will dampen profitability. Thus, steel industry modernization and expansion, with all of its benefits to the American economy, will not be possible if the United States government continues to involve itself in steel pricing — as it has done through many years of "jawboning" and formal controls. If such pressure on steel prices and earnings continues, the result will be shrinkage rather than growth in the domestic supply of steel.[1]

Price increases on steel products have often been perceived to have far greater importance in the overall economy than is actually the case. For example, steel mill products represent only 3.3% of the total BLS Producer Price Index. The direct effect of steel price increases is small, even on products produced primarily from steel. For example, a 5% increase in the price of steel increases the cost of an average car only about one-half of one percent (0.5%).

A. Price Constraints and Inflation

Government intervention into steel pricing has been based on the theory that price increases by companies in certain major industries are a primary cause of inflation. In fact, inflation is in large measure caused by overly expansive national fiscal and monetary policies, with attendant rapid growth in Federal spending and chronic deficits. As long as the Federal government continues to deficit-spend and overexpand the money supply relative to growth in real output, the resulting excessive growth in money supply will continue to force up the overall level of prices — irrespective of any general or selective price restraints that may be imposed by the government.

The basic problem of inflation from overly expansive Federal policies cannot be solved by price constraints that impair capital formation and investment in productivity improvement and increasing productive capacity — measures that are essential to curbing inflation. In its anti-inflation program announced in October, 1978, the Administration recognized that winding down inflation requires major anti-inflationary actions within the government as well as voluntary support by labor and management. While private sector cooperation has probably been at least as good as could be expected, there has been no significant progress thus far in curtailing inflationary government activities, and the overall inflation rate in 1979 has unfortunately soared well into the double-digit range. Clearly, wage-price guidelines or controls are not remedies for inflation.

The steel industry is more vulnerable to inflation than most other industries. Steelmaking requires large inputs of labor and energy, two areas where costs tend to increase more rapidly than the overall rate of inflation. Relatively low productivity gains have exacerbated the increases in both labor and energy costs. Additionally, increased operating costs associated with environmental expenditures add to the cost and price pressures. Vulnerability of the steel industry to inflation is increased by government policies that add to costs, and other government policies that prevent or delay recovery of the cost increases. The government has thus squeezed steel industry profits and hindered needed capital

[1] See Appendix B for a discussion of government constraints on steel prices.

formation from both ends — i.e., by causing cost increases while holding down selling prices.

B. Steel Prices and Earnings

The so-called "voluntary" price restraints in 1978-1979 were generally supported by steel companies as a temporary "holding action" within the much broader anti-inflation program involving labor, government, and business. However, this wide ranging program has been ineffective in many areas and has been notably unsuccessful in achieving the targeted reduction in the overall rate of inflation. As a result, a significant amount of the rapidly escalating costs of energy, raw materials, and other steel manufacturing costs could not be recovered by companies under the price guidelines, and this has adversely affected earnings.

Steel company earnings in early 1979, while reflecting improvement stemming from increased volume over previously depressed levels, remained far below the rate of return needed to compete effectively with other industries for capital funds. The relatively low return on investment in the steel industry reflects in part the cumulative impact of nearly two decades of government constraining actions on steel prices, as well as long periods of government inaction against unfairly and illegally priced steel imports.

In order to provide for the country's steel needs in the future without dangerous reliance on foreign sources, earnings of domestic steel companies must be freed from formal or informal price constraints that prevent realization of rates of return that an open and fair market for steel would support. The steel industry must earn a return on investment that is competitive with that for all manufacturing if it is to compete effectively for the available supply of capital funds to modernize existing capacity and to meet the growing needs of the nation for steel products.

In restraining steel prices, government fails to recognize that scarce capital will go where it earns a competitive rate of return. Consequently, arbitrarily forcing steel prices and earnings below a competitive level has the effect of diverting capital away from the industry — regardless of its importance to the markets it serves.

Since the demand for steel products is cyclical, the relative prosperity of the industry is cyclical. To earn adequate profits, the steel industry must be permitted to earn above-average profits in periods of high demand for steel to offset the below-average profits that it earns in periods of low demand. This has not occurred, however, because in periods of high demand the government has denied the steel industry an adequate profit by artificially and arbitrarily interfering with steel pricing actions.

C. Steel Prices and Domestic Steel Supply

In the latter part of 1973 and early 1974, when the demand for steel in this country far exceeded the domestic supply, the government arbitrarily ruled against steel price increases that had passed all the rigid price-control tests then in effect. In that period, foreign steel was imported into this country at huge premiums over domestic steel prices. As a result, foreign steel companies (whose prices were not controlled) earned investment capital in this country that was denied to American steel companies whose prices were controlled. To the extent that foreign steel companies used this investment capital to modernize and expand their own steel industries, this only aggravated the long-term problem of domestic steel supply.

America is the only major industrial nation that is incapable of producing all of its own steel requirements. In the long term, an adequate supply of steel at reasonable prices can only be assured through sufficient investment on the part of American steel firms. If American steel companies cannot expand and modernize, shortages of steel will develop, and much more steel will be imported at prices far in excess of domestic prices. This will be harmful to our nation's balance of payments and employment opportunities; it will also increase future inflationary pressures in this country.

Encouraging dependence on foreign steel capability, partially as a result of government price constraints, is indeed a short-sighted policy. Any apparent savings to American consumers of steel when import prices are below domestic prices will be more than offset by future steel imports at higher prices. Freedom from governmental price controls will not result in excessive price increases for steel products. There are numerous competitive deterrents to steel price increases, including the competition from competing materials and foreign steel firms, as well as among the many companies within the domestic steel industry.

Appendices:

Appendix A

Governmental Involvement in Foreign Steel Industries

A. Ownership and Control

As shown in Table A-1, American steel companies compete with foreign firms that are owned, wholly or partly, by their governments. Specifically, 30% of American steelmakers' Free World competition in terms of tonnage capacity is government-owned (50% or greater equity participation). And 45% of total world steel capacity (including communist countries) is government-owned as defined above.

Two trends have been recently fueling steel's move into the public sector. During the 1975-1977 downturn in international steel markets, a number of governments in developed countries bailed out their floundering steel industries by converting massive debts into "participating loans" and government equity holdings. The French restructuring plan, which includes government participation in Usinor, Sacilor, Sollac, and Chatillon Neuves-Maisons, is an example of this trend. Increasing government ownership of steelmaking capacity also results from ambitious steel investment plans in developing countries such as Brazil, whose production has almost doubled since 1972.

Table A-1 only addresses the question of direct and indirect ownership and does not take into account other forms of government assistance. One example is the preferential access to capital that Japanese steel firms enjoyed during the 1950s as a result of Japanese government policy that made the large-scale expansion of domestic steel capacity a main plank of national economic policy. Under this policy the Bank of Japan permitted Japanese commercial banks to maintain 90-100% loan-to-deposit ratios, and encouraged large loans to domestic steel companies. This practice resulted in a debt-to-total capitalization ratio of over 80% in the Japanese steel industry, a far higher ratio than would be possible if producers had to rely solely on the private capital market.[1]

Obviously, such indirect forms of government support or subsidization do not show up in a tabulation of government ownership of equity in steel enterprises. And, indeed, government ownership does not of itself necessarily lead to subsidization and distortion of market forces. But a subsidized government stockholder will be more sensitive to political pressures than a private shareholder. A government struggling with its responsibilities in regard to national unemployment, especially where labor unions are politically powerful, finds it far from palatable to lay off workers in nationalized industries. Instead, workers may be kept at work producing expanded inventories with the help of government inventory subsidies, (as was the case in Sweden during 1976 and 1977) or cutbacks in personnel may be linked to extensive government-funded steel investment programs, as in the case of the British Steel Corporation (BSC).

TABLE A-1

American Steel Producers Compete With Many Government-Owned Steel Producers

	Share of Capacity in which Government has Majority Ownership
Canada	13%
Brazil	68
Mexico	74
Venezuela	85
Other Latin America	69
France	69
West Germany	9
Italy	57
United Kingdom	79
Spain	39
Sweden	59
Other Western Europe	18
Republic of South Africa	72
Other Africa	75
India	82
Taiwan	12
Other Asia	4
Oceania	16
Total Noncommunist Countries	24%
Total Communist Countries	100%
Total World	45%

Source: American Iron and Steel Institute

B. Financial Aid by Governments

In the international economy today, market forces aren't the determinants of who produces steel and in what quantities. Government involvement in steel industry ownership and management,

[1] American Iron and Steel Institute, **Economics of International Steel Trade: Policy Implications for the United States**, May, 1977, p. 14.

as well as subsidization of operations, have grown enormously since World War II in international steel markets. As a result, subsidized steel imports enter the U. S. market every day and seriously distort, with respect to steel, the rational allocation of scarce resources by a free market economy.

As a matter of historical record, foreign government involvement in the management of their steel industries' affairs has been a major burden to taxpayers. British Steel Corporation is the classic example. This nationalized giant, which accounts for the major share of all steel production in the United Kingdom, has lost $2.55 billion over the last four years, including $717 million in fiscal year 1978-9. Forecasts for the coming fiscal year indicate another large loss, and it is estimated that BSC loses $38 on every metric ton of steel it produces. BSC's Chairman publicly admits that a company in the private sector in BSC's financial condition would have gone into bankruptcy long ago. British Steel's survival despite massive losses is the result of large-scale infusions of capital from the British treasury. The borrowing limit for 1979 was set at approximately $1.2 billion. With such relatively unrestricted access to capital, it is little wonder that British Steel, rather than liquidating assets, has been able to undertake a $4 billion capital investment program which adds substantially to its capacity.

Ironically, the U. K. government, in negotiating with labor unions regarding the planned closure of a number of obsolete plants, has repeatedly stressed the heavy losses suffered by those operations, underwritten by the taxpayers. Clearly, those noneconomic operations have been sustained by government subsidies, and much of the output has been channeled into the U. S. marketplace.

Not only has tonnage reached the U. S. that would not have been produced in the absence of government subsidies, but that steel has manifestly been sold at prices below actual production costs. It is paradoxical that the Trigger Price Mechanism, predicated on the presumed costs of the most efficient (Japanese) foreign producers, in effect permits flagrant dumping of products by what are probably the least efficient and highest-cost producers.

In summary, the injurious effects of subsidization on U. S. producers in a critical case like that of BSC are two-fold: competition from modern, efficient facilities is made possible by government financing that would not have been available from the private money market; and competition from high-cost inefficient production facilities continues; with products entering the U. S. at less than fair value from BSC and other non-Japanese producers because of inherent defects in the TPM.

While the British Steel case is commonly cited, it is far from being an isolated example. The most cursory review of the business press provides abundant evidence that government intervention abroad is the rule rather than the exception. For example:

- "Belgium has taken a 46% interest in Hainaut-Sambre Steel Company, the largest group in the country's southern region. The State converted debt owed it by the steel companies — totalling the equivalent of $355.6 million — to purchase the Hainaut-Sambre shares. It also acquired a 49% interest in a local steel trading company."[2]
- "The Finsider State steel group (in Italy) is taking another tack in pressing for more government backing and regulation of steel movements. Its Italsider affiliate lost up to half a billion dollars last year while maintaining an unchanged job force and raising output."[3]
- "The French State is to take over effective financial control of the country's near bankrupt steel industry. The main State and bank creditors have agreed to a five-year moratorium on debt repayments and to the imposition of a new financial superstructure on the country's three leading steel groups. When the restructuring is complete, the industry's creditors, including the State and State owned institutions will own about two-thirds of the capital of each of the three groups."[4]

Subsidization occurs in many ways. Some are obvious and massive, like government forgiveness of a private producer's debt; others are on a smaller scale and affect particular operating costs. The various forms of subsidization include conversion of debt into equity, loans, loan guarantees, debt forgiveness, inventory financing, regional location aids, special tax treatment, preferential utility or freight rates, raw material subsidies, export financing, and even ownership of distributorships by the State.

Financial aid tantamount to subsidization arises from international bodies as well as national governments. The European Economic Community (EEC) uses its considerable credit to float bonds in the United States and abroad to generate capital for loans to the European steel industry. It is certain that, given the European steel industry's financial condition in recent years, the individual steel companies would either not have been able to borrow funds in the money market at all or would have had to pay astronomically high interest rates.

The examples above relate only to the developed countries, but therefore tell only part of the story. Many developing nations feel impelled, as a matter of national pride or basic economic policy, or both, to develop a domestic steel industry. The pattern that evolves is as follows: Facilities are planned to take full advantage of the economies of scale that the most modern technology will allow. Funds for the undertaking are obtained from a variety of sources: allocations from the national treasury, loans from international banking consortiums (both

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2 **Wall Street Journal**, June 20, 1979.

3 **Journal of Commerce**, September 8, 1978.

4 **Financial Times**, September 21, 1978.

private and public), development financing institutions, and foreign government export promotion financing. And so, in most of these cases, funding is made possible by government sponsorship of new steel operations that private capital sources would not have financed in view of depressed industry conditions.

Evidence of government-funded steel projects in developing countries is plentiful, as again is readily evident from press reports:

- "NEW DELHI - Outlay on developing the steel industry in the public sector in the current sixth five-year plant (April 1978 - March 1983) is set at $3,183 million, according to Steel and Mines Minister Biju Patnaik."[5]
- "CARACAS - Sidor's Plan IV expansion is central to CVG's (Guayana Development Corp.) plans. The project will raise Sidor's steel production capacity from 1.2 million to 5 million tons annually by 1980, and involves construction of a wholly integrated complex using the world's most advanced ore reduction technology."[6]
- "The total cost (of the Acominas Steel Works now under construction in Brazil) . . . comes to $3.455 billion. Forty percent of this sum, or $1.38 billion is covered by shares; 60 percent ($828 million) belongs to the Brazilian steel agency Siderbras, 20 percent to the State of Minas Gerais, and the remaining 20 percent is now being subscribed by various shareholders including Acominas' major suppliers, both Brazilian and foreign. The remainder of the cost - 60 percent, or $2.073 billion - is being raised from national and international sources."[7]

The significant point is that government involvement in financing steelproducing facilities removes the discipline of market economics in a manner that clearly and unfairly puts private, market-based producers like those of the United States at a serious disadvantage. If the steel industry worldwide were strictly market economy-based, the poor profits — or heavy losses — in the years since 1974 would have tended to keep capital from flowing into the industry. Non-competitive facilities would have ceased production, investment in new facilities would have slowed, and available supply would have moved closer to demand. At that point, with higher capacity utilization rates, profitability could have improved and investment capital might have found steel more attractive. But U. S. producers, operating in a market-based U. S. economy but in an international steel economy that is no longer market-based, have had the worst of both worlds as a result of foreign government subsidization. They have been starved for capital in the U. S. because equity and loan capital markets have found our steel industry to be unattractive as a result of low profitability. At the same time, foreign steel capacity that couldn't survive in a market economy has continued to pour steel into the U. S. marketplace. This has worsened the competitive and profit position of U. S. producers and hindered modernization and expansion — in a continuing vicious circle.

While the basic distortion of efficient resource allocation resulting from subsidization is readily apparent in terms of economic theory, what is not well understood is the considerable technical complexity of defining and measuring subsidization so that the disadvantage resulting for other producers can be expressed in terms of dollars and cents. Yet it is essential that a methodology be developed if the new international GATT code and U. S. legal rules on subsidized imports are to be implemented satisfactorily.

For example, consider such simple, smaller-scale subsidies as special freight rates provided for domestic steel producers by government-owned railways. The amount of the freight rate rebate or reduction is the amount of the subsidy. But a painstaking, continuous process of cataloguing and monitoring would be necessary to assess precisely the total value of all such subsidies to the various steel industries of the world.

Another example is the case of larger subsidies such as the conversion of hundreds of millions of dollars' worth of debt into equity. How is the sum so written off to be translated accurately and fairly into an amount of subsidy per ton of product shipped?

Given the massive scale of subsidization as described in this section, it seems clear that a major challenge confronts the U. S. government agency responsible for enforcing fair trade laws affecting steel and other products. That agency should embark on a long-range program of data-gathering and analysis, and routinely monitor foreign subsidies, so as to facilitate the vigorous enforcement of U. S. laws.

The American steel industry recognizes that sovereign nations overseas have every right to subsidize whatever industries they wish, and as much and however they wish, in pursuit of their own domestic political and economic objectives. But they do not have a right to injure U. S. producers (or producers of other nations) by exporting the products of those subsidized industries into other markets at less than fair value. This must be a key principle of policy for the U. S. government in conducting its international trade relations.

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[5] **Journal of Commerce**, September 19, 1978.

[6] **Ibid.**, July 9, 1979.

[7] **Financial Times**, September 14, 1978.

Appendix B

History of Governmental Constraints On Steel Prices

A. 1960-1970 — "Jawboning"

During the 1960s, "jawboning" pressures on steel price increases were highly publicized. The end result was that while inflation and rising costs gathered momentum under the "guns and butter" policies of the late 1960s, steel company prices and earnings were repressed to such an extent that by 1970 and 1971 the industry's aggregate return on sales was down to 2.8% — the lowest return in more than two decades.

B. 1971-1974 — Mandatory Controls

It was in the setting described above that the steel industry entered the 1971-1974 period of mandatory controls. During these years steel price increases that were fully cost-justified under the rules were subjected to extraordinary delays and arbitrary deferrals.

A general price freeze was ordered by the President in mid-August, 1971. The steel companies and the steelworkers union had negotiated a settlement effective August 1, but only about one-half of the cost-covering steel price increases then announced had effective dates prior to the freeze. Phase II followed three months later, requiring prenotification, cost justification, and approval of increases above the prices that were in effect at the date of the freeze. As a result of these procedural requirements, the steel price increases announced but not yet in effect in early August, 1971, for the most part could not be implemented before 1972. Subsequently, market conditions to a large extent precluded steel companies from realizing any significant amount of the cost-justified price increases allowed under the Phase II rules until late 1972 and early 1973.

In January, 1973, Phase II was replaced by Phase III, under which the prenotification requirement was dropped, although the cost justification rules remained in effect. Business conditions generally improved in 1973, and there was a general escalation of inflation during the first half of the year.

In June, 1973, prices were again frozen by Presidential order. Consequently, cost-justified steel price increases announced in May, 1973 (to become effective in June) were suspended until Phase IV. After the Phase IV rules were issued in August, 1973, the Cost-of-Living Council was formally prenotified of these price increases, and a public hearing was held, with witnesses from the public sector, consumer groups, and economists, as well as the major steel companies involved.

The net result of this series of events was a "Special Rule" for steel, issued in September, 1973, conceding full justification under the new Phase IV rules for the steel price increases originally announced in May. However, it permitted implementation of only one-half of the price increases on sheet products commencing in October, 1973, with the other half deferred until January, 1974. The rule specifically foreclosed cost-justified price increases on all other steel products until January, 1974, subject to another review and public hearing in December, 1973. This Special Rule for steel was explained as necessary to be "consistent with Phase IV's general objective of spreading the post-freeze bulge". Fully cost-justified steel price increases were thus delayed more than six months by the sixty-day general price freeze.

Another Special Rule was issued in December, 1973, which allowed a limited pass-through of scrap cost increases, but which otherwise extended the deferral of cost-justified price increases on steel products other than sheets. This deferral was subsequently further extended through February, 1974. In the final two months of the controls ending April 30, 1974, steel prices continued to lag behind cost increases, and this lag continued through most of 1974 — because steel markets by then had begun to soften and rising costs after the lifting of controls nullified the hoped-for benefits.

C. 1974-1978 — Informal Controls

In the post-controls period of 1974-1978, the Council on Wage and Price Stability (CWPS) focused an inordinate amount of attention on steel price increases. In fact, the Council pointed to a partial rollback of announced steel price increases in December, 1974, as its most important accomplishment on prices through June, 1975. Later in 1975, following steel company announcements of price increases on sheet products, the Council urged other producers to exercise restraint and notified major steel users such as automobile firms to exclude such price increases in attempting to justify their price increases.

In June, 1976, pursuant to the President's request for an analysis of steel price increases then going into effect, the Council reported that "cost increases have outpaced price increases over the 1972-1976 period and. . .(in the first quarter) both the

rate of income to net sales and the rate of net income to stockholders' equity were below the corresponding base period levels and below the respective averages for all manufacturing companies". Nevertheless, the Council subsequently criticized price increases announced in the latter part of 1976. Despite continuing interference with steel pricing, the overall national inflation rate approached the double-digit range in 1978.

Appendix C

Research and Development in the American Steel Industry

A. Domestic Steel Research

Domestic steel companies have long recognized the importance of research and development. Before the advent of separate research and development departments, this function was typically carried out in steel companies by the quality control, engineering, and/or operating departments. In the 1950s and 1960s, most of the larger steel companies in the United States established research centers and laboratories. During this period at least ten major research centers were established.

The benefits of R&D flow between industries. For example, companies supplying refractories, iron ore, coal, energy, etc., have extensive research facilities, and their new and improved products benefit steel producers. By the same token, much of the research done within the steel industry relates to applications of steel mill products, and this significantly benefits steel consumers. Many engineering firms that serve the steel industry have research facilities that benefit steel producers and consumers.

Steel producers also frequently use the capabilities of outside research organizations. Battelle Columbus Laboratories, IIT Research Institute, Stanford Research Institute, and Arthur D. Little, Inc., are typical of independent research organizations that have been utilized from time to time. The American Iron and Steel Institute also sponsors research, much of it basic or fundamental research carried out in academic institutions.

Joint industry-government research activities have been conducted in the past and, although not numerous, some have been beneficial and successful. One illustration is the joint effort of Blast Furnace Research Incorporated and the Bureau of Mines in the early 1960s to conduct research studies using the experimental blast furnace at Bruceton, Pennsylvania. Pioneering work was done in the areas of utilization of high blast temperatures and injected blast furnace fuels, development of new and improved burden materials, and utilization of metallized burden materials. More joint activity could well take place in the future.

B. Technology in Specific Areas

1. *Raw Materials*

The thrust of research and development activities in the area of ironmaking raw materials has been to improve these materials for their ultimate use in the blast furnace. The principal benefits have been increased iron production rates and lower coke consumption rates. Pioneering work has been done in the United States on the beneficiation of iron-bearing (taconite) materials and specifically the development of iron ore pelletizing.[1] This has led to the construction and operation of huge pellet plants in the iron ore regions of the United States and Canada.

The national interest has been well served with the development of taconite concentrating and pelletizing processes. They have made the American economy less dependent on foreign ores. Less dependence is important, particularly during times of national emergency. Reduced iron ore imports have also helped to hold the nation's balance of trade deficit below what it otherwise would have been.

Coal has been upgraded with the installation of coal washing plants at the mines where metallurgical coal is produced. This has led to a reduction in ash and sulfur content of the cleaned coal, offsetting the recent increase of impurities in the raw coal.

The thrust of future research and development will no doubt give increased attention to beneficiation and agglomeration of the waste dusts and sludges generated in steelmaking to permit recycling. This effect will be closely tied to environmental efforts in steel plants.

2. *Cokemaking*

Developments in cokemaking during the past ten to fifteen years have been related to productivity improvements, environmental improvements, and alternative cokemaking processes.[2] Productivity improvements have been achieved through the installation of larger coke ovens, which produce up to 50% more coke than older ovens. In some cases, shorter coking times have been achieved through the use of refractories with better heat transfer characteristics. Preheated coal has also been used

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[1] Pitler, Richard K., **Worldwide Technological Developments and Their Adoption by the Steel Industry in the United States**, Annual Meeting of American Iron and Steel Institute, May 26, 1977, p. 3.

[2] **Ibid.**, p. 3.

to reduce coking time and increase coke oven productivity.

The conventional by-product coke oven is a major environmental problem for coke producers. Because it is a batch process and because it has many doors and openings through which coal is charged and coke is pushed, it does not lend itself readily to good environmental control. Techniques have been developed to improve control of emissions during charging and pushing operations, and large sums of money have been spent to implement them. Nevertheless, coke plants continue to pose many and difficult environmental control problems.

In looking to the future, the development of "formcoke" (formed coke) processes would answer the need for a continuous cokemaking process that is completely enclosed, economically viable, and capable of producing a superior blast furnace fuel from a wide range of coals. Major formcoke processes can be categorized into briquetting and pelletizing. The Federal government could make a significant contribution by funding large pilot or demonstration plant activities. This would cost tens of millions of dollars, but a new and improved method of producing coke is vitally needed.

3. Ironmaking

Ironmaking technologies may be divided into two areas: blast furnace technology and direct reduction. Blast furnace ironmaking has undergone a long evolutionary development and accounts for over 98% of the world's ironmaking capacity. Direct reduction technologies have been known for over 75 years but only recently have become commercially practical.[3]

The blast furnace is the largest single energy consumer in the steel plant, but it is an energy-efficient process. Most research into raw materials has been directed toward reducing coke rates and increasing the productivity of blast furnaces. In recent times, major emphasis has been placed not only on burden improvements but also on the use of scrap, injected blast furnace fuels, higher blast temperatures, and installation of larger blast furnaces. Research activities directed toward coke rate reductions in order to reduce the energy appetite of the blast furnace no doubt will continue, as will the development of even larger blast furnaces. Research attention will also be given to automation, and to environmental improvements in the area surrounding the blast furnace.

Direct reduction will receive more research attention in the United States in the future. As more electric furnaces are installed, direct reduction will be needed to provide metallic iron units from iron ores and thereby reduce the dependence of electric furnaces on scrap. Efforts are needed to develop an improved coal-based direct reduction process. (Most direct reduction processes today are based on gas or oil.) In the United States, where oil and natural gas are becoming scarce, and coal is abundant, the direct reduction processes of the future logically should be coal-based.

4. Steelmaking

The 60s and early 70s saw the emergence of the BOF as the principal steelmaking method in the United States. There was also an increase in electric furnace steelmaking capability. Improvements have been made in oxygen steelmaking processes by using oxy-fuel lances to preheat scrap and increase the amount of scrap that can be used. Bottom-blowing techniques have been introduced to improve yields, reduce capital costs, and produce a wide range of products. In the future, one can expect to see improved process control in the oxygen steelmaking processes. Process-control systems have been developed that use computers and auxiliary water-cooled lances with expendable sensors to provide improved control of steel composition and temperature as well as increased productivity. They are being implemented at an increasing rate. Also, the pre-treatment and post-treatment of hot metal and liquid steel will become more important factors in steelmaking, as will the ability to use larger amounts of scrap.

The stainless and high alloy segment of the steel industry has benefited from the development and commercial application of the argon-oxygen decarburization process (AOD), which has markedly improved the productivity and economics of specialty steel production. This American invention has gained worldwide acceptance and application.

5. Continuous Casting

Continuous casting of billets, blooms, and slabs for rod, bar, plate, sheet, and tin mill products is being implemented as rapidly as is economically feasible to take advantage of lower capital-facilities and operating costs, yield and energy savings, and product improvement. Developments in the areas of process modification, operating practice, and control systems have enhanced the inherent advantages of continuous casting — namely, productivity, yield, quality, and costs.

6. Rolling

The 60s and early 70s witnessed the development of a new generation of powerful hot-strip mills. This was followed by larger and more powerful cold reduction mills offering improved cold-rolled products. The advent of better gage controls also resulted in improved products for steel consumers. The developments can be expected, with continuing research efforts, to result in continuous cold mills of greater productivity and improved product quality, replacing conventional cold rolling. The future will also see large continuous-annealing facilities to produce drawing quality and other steels with special properties as required by consumers. Research effort will also go to improve and make steel proper-

[3] **Ibid.**, p. 7.

ties more uniform. This will be reflected in more uniform chemistry, more uniform physical properties, and more uniform gage control, to enable consumers to take advantage of automated equipment.

In the same vein, the new generation of plate, bar, and rod mills provides higher productivity and better control of product dimensions and properties. These improvements have been made possible through the development of instrumentation and computerized systems for achieving better control over the thermomechanical aspects of the rolling operation, even at the accelerated rolling speeds possible with the new mills.

C. Product Research

Much recent research activity has been devoted to developing products in response to consumer needs. Steel producers' responsiveness is evidenced by the broad range of products available, including coated and uncoated, flat-rolled and structural, conventional and high-strength steel. As an example, coated products now available to the automotive industry provide increased corrosion resistance and include zinc-aluminum coatings and two-side and one-side galvanized steel products. For the container industry, lighter tin coating and tin-free steels have been developed by steel producers to provide a lower-cost material for container manufacture not dependent on tin, which is expensive and in short supply. Other new and improved products have been developed by a variety of producers — products with improved electrical characteristics and improved shape.

In looking to the future, the steel producers must continue to be vitally concerned with the problems faced by steel consumers. In the automotive industry, for instance, weight reduction will be a key consideration in the 80s in order to meet mandated fuel economy goals. Producers are known to be developing a wide variety of high-strength and corrosion-resistant steels that can be used to meet weight-reduction requirements. For other industries, new products will need to be developed to meet changing product requirements. For example, more efficient electrical steels to help reduce energy requirements; new coated steels for drawn-and-ironed can application; and high-strength steels and specialty steels for products needed by a variety of consumers to meet specific end-use requirements. Domestic steel producers are ideally situated to be responsive to the needs of domestic steel consumers; this is an important advantage over distant foreign competitors.

D. Environmental & Energy Research

Environmental research necessarily will continue. As the major pollutants have been eliminated, it becomes increasingly difficult to capture the last small quantities still being emitted. In air pollution studies, it is expected that research will make significant contributions to the improvement of scrubbers, filters, cyclones, and other such devices, as well as to making these units more energy-efficient. Devices will be needed with improved abilities to remove solid and liquid particulates from air and gas streams. Research into process alterations also will be needed to avoid or reduce emissions of particulate matter.

In water pollution, thickeners and filters conventionally are used to recover solid materials. The continuing need to minimize the amount of solids or liquids going into water streams that have to be processed for pollution control suggests that research into new capture devices such as magnetic units will be required.

One of the key technological changes that must take place relates to utilization or disposal of pollutants after they are recovered. Frequently, these materials are in forms that are difficult to handle and are contaminated with residual elements and/or such substances as oil. Extensive research efforts into recovery and utilization of the sludges and wastes will be required to solve these industrial problems.

Noise control will also receive attention. This will involve developing better noise-suppressing devices and altering processes to minimize noise levels.

Energy is one of the major cost items in the production of steel. Research attention will be given to reducing the quantity of energy that is used to produce a ton of steel. Currently, about two-thirds of the energy used in the steel plant is derived from coal sources, about 20% from natural gas, about 8% from petroleum products, and about 5% from purchased electricity. Future attention will be directed toward utilizing more coal and reducing dependence on oil and gas. All major steel companies have energy conservation programs currently under way. In addition to the blast furnace, other large consumers of energy include coke works and hot-strip mills with their associated reheat furnaces. Efforts directed toward increased utilization of scrap will have energy conservation benefits because use of scrap rather than iron ore results in less energy being consumed in the total steelmaking operation.

Finally, steel producers will contribute to the synthetic fuel industry by developing corrosion-resistant and high-temperature steels to withstand the severe operating conditions.

E. AISI Research Activities

The American Iron and Steel Institute sponsors a research program, administered by the Institute's Committee on General Research.

Research sponsored by the Institute is directed toward the increase of knowledge and understanding of (1) the processes involved in converting raw materials to final products, (2) the control of those processes, and (3) the factors that govern the properties and successful application of steel products. Emphasis is placed on obtaining basic technical information that can be utilized by the individual com-

panies and users of steel products.

Much research aimed at obtaining such basic information is especially suited to the atmosphere of university research laboratories which are interested in seeking new knowledge and in training young people in the scientific approach to technological problems. Projects sponsored by the Institute at universities are normally of several years' duration and may be organized to satisfy the requirements of the researchers' doctoral programs. Other research may be less basic and more mission-oriented, focusing on specific technical or engineering problems.

Projects may be sponsored at any university facility capable of effectively handling the work.

Research in the area of the environment has been sponsored by the Institute since the late 1930s[4]. Applied research in this area is under the supervision of the Technical Committee on Environmental Quality Control. Current and past projects include the treatment of oil-bearing waste water, the development of instruments to evaluate odor in water, the chemical and physical methods for reducing the discharge of ammonia, the use of magnetism in waste treatment, and advanced analytical procedures for quantifying trace contaminants. Close liaison is maintained with the Environmental Protection Agency on research into new control technologies and consideration of advanced control requirements. The control of coke-oven emissions is also of paramount importance to the steel community, and research to improve the atmosphere around coke ovens has been under way for many years.

F. Government Support

Federal government support of steel industry research is quite modest. It is at lower levels than support for such industries as chemicals, machinery, electrical equipment, and aircraft. This was recognized in the Solomon Task Force report to the President, which made the following recommendation:[5]

> "The Task Force recommends that in addition to your request for expediting evaluation by the Justice Department of the steel industry R&D venture proposals,the President directs that an examination be conducted of the adequacy of Federal R&D funding in the steel industry with specific reference to funding of research on energy conservation and pollution abatement technology."

Large-scale research funding could be used beneficially in the areas of energy and environment. The Department of Energy retained Arthur D. Little, Inc., to study energy conservation opportunities in the steel industry. Their report of January, 1978,[6] listed projects with significant energy conservation potential. Since the steel industry is one of the major energy-consuming industries in the United States, Federal funding of these projects is well justified.

Department of Energy funds could assist in the development of formcoke processes. Major pilot plant facilities or demonstration plant facilities are needed to complete development of these processes, and Federal funding is merited.

Government funding is also warranted in the development of new products to meet the corrosion, high-temperature and high-pressure environments of the synthetic fuel industry.

G. Conclusion

Research and Development has played a key role in the emergence of new steelmaking technology in the United States, and will continue to do so. Steel producers must be responsive to the needs of customers. R&D activity will be directed toward developing new and improved products to meet changing needs. In steelmaking technology, American steel producers have pioneered in many areas and have adopted new technology regardless of origin. Increased government support of research in areas of interest to the steel industry is needed and is fully justified. A particular need is for funding of costly pilot plants and demonstration plants that are needed to prove out processes.

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[4] American Iron and Steel Institute, **A Summary of Its Purposes and Activities**, "Research in Iron, Steel and Environment," September, 1978.

[5] Solomon, Anthony M., **Report to the President — A Comprehensive Program for the Steel Industry**, December 6, 1977.

[6] Arthur D. Little, Inc., **Research, Development and Demonstration for Energy Conservation: Preliminary Identification of Opportunities in Iron and Steelmaking**, Report to Division of Industrial Energy Conservation, Department of Energy, January, 1978.

Appendix D

Opportunities for Energy Conservation In the American Steel Industry

An assessment of potential energy savings requires a review of the numerous and complex processes involved in the production of steel. The quantitative data presented in this review are based on various sources, including AISI statistical reports, various studies prepared by Battelle Columbus Laboratories for the Department of Energy, and the judgments of experts on energy matters within the steel industry.

The domestic steel industry employs five basic processes (iron ore reduction; steelmaking; primary conversion; hot-rolling or forming; and final shaping and treating) to produce a wide range of steel products varying in shape, size, chemistry, and physical properties.

A. Ironmaking

The ironmaking process comprises three separate operations: sinter plants; coke ovens; and blast furnaces.

Energy consumption in the *sintering operation* is on the order of 2 million Btu per ton of sinter production and some three-fourths of the total energy is supplied by coke breeze from the coke plants. The remaining one-fourth is ignition fuel, usually natural gas or distillate oil, and electricity required for material and waste gas handling. The largest possible potential saving is heat recovery from waste gases, but recovery is not now economically feasible and the magnitude is not significant in relation to total specific energy consumption for steel products.

The other companion of the blast furnace ore-reduction process is the *coke production process*. The major component of energy use in the coke plant is for heating the coal charge, requiring some 3 to 4 million Btu per ton of coke produced. Additionally, steam and electricity of 1.5 to 2 million Btu per ton of coke production are required for handling input coal and products, separating and cleaning the gases, tars, light oils, and in waste treatment. These requirements differ with varying coal properties and with individual plant configurations.

Thus, the total coke conversion energy, including losses, is in the range of 5 to 6 million Btu per ton coke production. With present coke consumption at about 0.6 ton per ton of blast furnace iron production and blast furnace iron production averaging about 0.9 ton per ton of finished steel production, coke conversion energy equates to approximately 10% of total steel industry energy requirements.

Potential for conservation in the coking process includes installation of new, more efficient ovens, dry-quenching of coke, general housekeeping measures, recovery of low-level waste heat from stack gases, and improvements in steam-cycle efficiencies. In the housekeeping area, regular surveillance and maintenance are required to assure efficient combustion in thousands of flues within the oven-refractory mass to maintain uniform and efficient heating of the coal charge. Some recent improvements have been effected in this area, but the potential for further savings is not expected to be of great significance in terms of total energy consumption by the steel industry.

The largest single potential savings at the coke plant is associated with the quenching of 2000° F coke to ambient temperatures. Presently the hot coke, after pushing from the ovens, is cooled by water sprays, and the sensible heat lost to the atmosphere is some 1 to 1.2 million Btu per ton of coke. Dry quenching would greatly reduce the heat loss, but the required capital expenditures for retrofitting in the United States cannot be justified by the value of heat recovered even at current costs for energy. In the case of a new greenfield plant, however, "dry quenching" would be given due consideration as a potential source of savings.

The largest energy consumer in the total steel production process is the *blast furnace*, the central production unit where actual ironmaking takes place. During the last few years, energy input to the blast furnace in the form of coke has been about 1,200 pounds per net ton of iron production. Additionally, oil or coal tar, equivalent to a reduction of 5 to 10% of the coke charge, has been injected into the furnace. Also, as energy inputs, the hot blast air is compressed by the furnace blowers and preheated in regenerative stoves to various temperatures ranging from 1400° F for the older furnaces to above 2000° F for the newest furnaces. About 40% of the heating value of the coke and hydrocarbon input to the furnace is ultimately utilized as by-product blast furnace gas. Roughly 75% of this gas is consumed in the blast-air preheating process and to generate steam to drive the blast furnace blowers. The remaining blast furnace gas, in

most cases, is consumed in generating steam for other plant needs. Other energy requirements at the blast furnace are relatively small.

The total average blast furnace energy consumption is in the range of 15 to 16 million Btu per ton of iron production for the domestic industry. Based on an historic ratio of about 0.9 tons of basic iron production per ton of apparent finished steel production, this equates to almost half of the total net energy consumption by the steel industry.

The largest potential for conservation lies not in radical process changes but in process improvements such as higher blast temperatures, higher furnace pressures, larger furnaces with modern blowing equipment, and improved burdens. Together these factors can reduce coke consumption from about 1,200 pounds to 1,000 pounds per ton of iron production.

This reduction in input fuel along with efficiency improvements in modern auxiliaries have potential savings appraised at 2.0 million Btu per ton of iron production. Also, about 0.6 million Btu of coke conversion energy will be saved per ton of iron production because of the reduced blast furnace coke consumption rates.

The total savings of 2.6 million Btu per ton of iron production equates to approximately 2.3 million Btu savings per ton of finished steel production — or a savings of 8% from the current base specific energy consumption. To attain all of these savings, however, a large portion of domestic blast furnace capacity would have to be replaced or greatly improved. A portion of these savings will be attained through the historic practice of retrofitting during the regular relining programs. And, in the case of new furnace construction, all improvements are likely to be included.

B. Steelmaking

The second step process is steelmaking, which involves iron-conversion, scrap melting, and refining. The three processes currently employed in the domestic steel industry are: the basic oxygen process (61% of raw steel production); the electric furnace process (23%); and the open hearth process (16%).

The three processes vary significantly in energy requirements: average consumption in domestic open hearth furnaces is estimated at 3.3 million Btu per ton of raw steel. The basic oxygen process requires about 0.5 million Btu per ton, and the electric furnace about 2 million Btu per ton (electricity converted on the basis of 3,413 Btu/kwh). Using these coefficients, and assuming that the remaining open hearth production is replaced by basic oxygen and electric furnace processes, it is estimated that energy consumption will be further reduced by approximately 0.6 million Btu per ton of finished steel production.

Further potential exists in the recovery of waste gases from the basic oxygen process. These gases, relatively rich in carbon monoxide, are now being flared in the United States. Because of the cyclic nature of the basic oxygen process (i.e., gases generated for 15 to 20 minutes of a 40- to 50-minute steelmaking period), expensive and complex recovery and storage systems are required, and have not so far been economically justifiable. If, however, the open hearth process is replaced by the basic oxygen and electric furnace processes, and all present basic oxygen furnaces in the United States were to be economically retrofitted with waste gas recovery, potential energy savings are appraised at about 0.4 million Btu per ton of finished steel production.

The total potential for open hearth phase-out and waste gas recovery is approximately one million Btu per ton of finished steel production, or approximately 3% savings from current specific energy requirements.

Some 60% or more of all energy consumed by the steel industry is consumed up through the two processes that have been discussed: iron ore reduction and steelmaking. At this point, the refined steel is in liquid form at about 3100°, for subsequent casting and shaping in the third step.

C. Primary Conversion

In the third production process step, the liquid steel might be cast into a final product, but cast final products currently represent a very small percentage (less than 1%) of steel industry shipments. The direct or continuous casting process is more energy efficient than the ingot casting-mechanical reduction process by approximately 1.5 million Btu per ton of intermediate product because the ingot soaking or reheating process is eliminated. Additionally, the yield from raw steel to intermediate product is some 10-15% better for continuous casting than for mechanical reduction or primary rolling. Thus, an additional energy savings accrues to continuous casting by not having to provide as much raw steel as in the primary rolling process.

The total replacement of primary rolling with direct or continuous casting could produce savings of about 5% in total specific consumption for finished steel. However, realization of these savings will not occur rapidly because the technology for continuously casting all grades of steel is not completely commercialized at this point. Furthermore, the complexities, economics, and capital requirements for retrofitting are deterrents to rapid growth of continuous casting in existing plants. New greenfield plants afford the greatest opportunity for continuous casting.

D. Hot Rolling

The fourth process step comprises the hot working and shaping of the semifinished products from the third step into desired sizes and shapes for direct shipment or further shaping, treating, and coating. Three mechanical pressure methods are employed in the shaping process: forging, extruding,

and rolling. Rolling is by far the predominant tonnage method. It employs multiple pairs of cylindrical steel rotating rolls between which the steel piece, preheated to some 2200° F—2400° F, is reduced in size and/or changed in shape as it passes through the rotating rolls.

The hot-rolling process requires significant quantities of electrical energy in powering the mill rolls, in material handling, and in the pumping of cooling water, but generally this process affords little potential for future savings. The largest component of energy is consumed in the semifinish-preheating operation. It is estimated that the industry average for this reheating function is in the range of 2.8 to 3.0 million Btu per ton of steel heated. This requirement equates to an average heating efficiency of about 25%. In many of the older operating furnaces, the efficiency is even lower, while the heating efficiency will approach 50% for a modern furnace, well-insulated and fully equipped for waste-heat recovery.

Potential for conservation in the reheating process is roughly appraised at 5% of total specific consumption. To the extent that new furnaces are constructed, the full potential will be realized, and insulation systems will be added and improved on existing furnaces. Some of the existing furnaces will be retrofitted with improved waste heat recovery devices, but for others the costs for retrofitting will be prohibitive.

Further savings are potentially available with development of direct rolling technology in which the hot slab, bloom, or billet from the primary conversion process immediately enters the hot rolling mill — eliminating the reheating requirement. Although rails and structural beams, to some extent, are currently produced in this manner, the full potential savings must be considered as long range.

E. Finishing

An estimated 6% of all energy consumed by the steel industry is consumed in this multitude of process functions. The individual energy consumers in this area are myriad, and in most individual processes energy demand is very small in terms of total requirements per ton of finished product.

The annealing process, however, is significant. Some savings have been effected recently through conversion of batch-type radiant tube heating to direct firing, and in the replacement of high-density refractories with ceramic fiber of lower density and lower thermal conductivity. Further savings will accrue in this area as these modifications can be appropriately accommodated in repair and maintenance expenditure schedules of additional individual plants.

Minor improvements will undoubtedly be achieved in many operations under the ongoing energy-conservation programs at each steel plant. As an indication of impact, a guess of 10% improvement in this area might be attained over a 5- to 10-year period, but this would equate to only 0.6% of total consumption per ton of finished steel produced.

F. Ancillary Energy-Saving Operations

The foregoing description covers a very broad appraisal of potential energy savings in each of the five process categories selected for this discussion. Additionally, various other ancillary items contribute to energy use in the steel industry. Outside actual process use, material handling, general plant utilities (excluding captive power generation but including water pumping, compressed air, and space heating) require significant quantities of energy. It is estimated that these uses are on the order of 2% of total industry energy consumption. The potential for savings is limited to general housekeeping measures.

G. Captive Power Generation

Beyond direct process requirements, some 16% of the electric power consumed by the steel industry in 1978 was supplied by captive generation. This was the rough equivalent of the output of two large, modern power plants. Most of the existing capacity is, however provided by many small units of pre-World War II vintage, and driven by steam turbines or other prime movers with heat rates 50% to 100% above present modern power plants. Various peculiarities perpetuate the maintenance of these units. In many cases they generate 25-cycle power required for driving mill motors and auxiliaries of 25-cycle design. The primary energy source is usually a low-value by-product fuel such as blast furnace gas, and it would be uneconomic to eliminate or to replace the existing systems.

Assuming replacement of all captive power generation, the energy savings could be about 2% of the total energy now being consumed by the steel industry.

Additionally, many old and relatively inefficient steam turbines such as blast furnace blower drives, and even a number of older reciprocating steam engine mill drives, are still operating in the steel industry. Were all of this equipment to be replaced by modern steam-cycles or electric motor drives, energy savings would be substantial. However, in relation to the complexities and the high capital cost for retrofitting, these older facilities are still cost-effective. As major facility replacements or major additions are made to existing plants (such as the installation of new blast furnaces) some of these potential energy savings will be realized. Entirely new greenfield plants would of course incorporate only the most advanced and energy-efficient equipment.

In addition to the above technologies, other possible energy-saving technologies are being investigated. They include such projects as reclaiming low-level waste heat from cooling water, reclaiming the sensible heat in hot semifinished steel, recovering waste heat from molten blast furnace slag, and

recovering low-level heat from waste gas streams via the organic rankine, or bottoming, cycle. The industry is well aware of the potential and the associated problems in all of these areas. At present they are not cost-effective projects, and the potential for each is very small in terms of total specific consumption. Depending on the relative cost of energy, however, some of these projects will no doubt be undertaken and will probably make a small contribution to the total steel industry conservation effort.

Appendix E

American Steel Industry
Selected Financial Statistics

Table E-1

Corporate Profits Rates:
Steel Versus All Manufacturing Average

	Steel Companies' Profits After Taxes (millions of $)	Steel Companies' Profits After Taxes As a Percent of Revenues	Profits After Taxes As A Percent of Stockholders' Equity*	
			Steel Companies	All Manufacturing
1954	637	6.0%	9.4%	12.4%
1955	1,099	7.8	15.4	15.0
1956	1,113	7.3	14.1	13.9
1957	1,132	7.3	13.1	12.9
1958	788	6.3	8.3	9.8
1959	831	5.8	8.4	11.7
1960	811	5.7	7.9	10.6
1961	690	5.2	6.5	9.9
1962	566	4.1	5.3	10.9
1963	782	5.4	7.3	11.6
1964	992	6.1	9.0	12.6
1965	1,069	5.9	9.4	13.9
1966	1,075	5.9	8.9	14.2
1967	830	4.9	6.9	12.6
1968	992	5.3	8.2	13.3
1969	879	4.6	7.0	12.4
1970	532	2.8	4.1	10.1
1971	563	2.8	4.3	10.8
1972	775	3.4	5.8	12.1
1973	1,272	4.4	9.3	14.9
1974	2,475	6.5	17.1	15.2
1975	1,595	4.7	9.8	12.6
1976	1,337	3.7	7.8	15.0
1977	22	.1	0.1	14.9
1978	1,292	2.8	7.3	15.9

*Based on Equity at beginning of year.

Sources: American Iron and Steel Institute, Citibank N.A.

Table E-2

Cash Flow Data

Millions of Dollars

	Profits After taxes	Depreciation, Depletion, etc.*	Gross Cash Flow	Cash Dividends	Net Cash Flow	Capital Expenditures
1954	$ 637	$ 703	$1,340	$343	$ 997	$ 609
1955	1,099	783	1,882	437	1,445	714
1956	1,113	794	1,907	508	1,399	1,311
1957	1,132	816	1,948	566	1,382	1,723
1958	788	713	1,501	540	961	1,136
1959	831	653	1,484	553	931	934
1960	811	840	1,651	564	1,087	1,521
1961	690	749	1,439	557	882	960
1962	566	958	1,524	508	1,016	911
1963	782	1,034	1,816	443	1,373	1,040
1964	992	1,046	2,038	462	1,576	1,600
1965	1,069	1,117	2,186	468	1,718	1,823
1966	1,075	1,199	2,274	483	1,791	1,953
1967	830	1,444	2,274	481	1,793	2,146
1968	992	1,316	2,308	452	1,856	2,307
1969	879	1,173	2,052	489	1,563	2,047
1970	532	1,128	1,660	488	1,172	1,736
1971	563	1,123	1,686	390	1,296	1,425
1972	775	1,196	1,971	402	1,569	1,174
1973	1,272	1,329	2,601	443	2,158	1,400
1974	2,475	1,553	4,028	674	3,354	2,115
1975	1,595	1,591	3,186	658	2,528	3,179
1976	1,337	1,614	2,951	637	2,314	3,253
1977	22	1,888	1,910	555	1,355	2,850
1978	1,292	2,010	3,302	533	2,769	2,538

* Includes changes in reserves.

Source: American Iron and Steel Institute.

Cash Flow Data

Millions of Dollars

	Excess (+) or Deficit (—) of Cash Flow over Capital Expend.	Change in Long-Term Debt	Capital Expenditures As a Percent of Net Internally Generated Funds
1954	+$ 388	+$ 159	61.1%
1955	+ 731	+ 61	49.4
1956	+ 88	+ 21	93.7
1957	— 341	+ 234	124.7
1958	— 175	+ 343	118.2
1959	— 3	+ 158	100.3%
1960	— 434	+ 185	139.9
1961	— 78	+ 480	108.8
1962	+ 105	— 115	89.7
1963	+ 333	— 159	75.7
1964	— 24	+ 179	101.5%
1965	— 105	+ 245	106.1
1966	— 162	+ 659	109.0
1967	— 353	+ 423	119.7
1968	— 451	+ 396	124.3
1969	— 484	+ 7	131.0%
1970	— 564	+ 526	148.1
1971	— 129	+ 10	110.0
1972	+ 395	+ 85	74.8
1973	+ 758	— 267	64.9
1974	+ 1,239	— 312	63.1%
1975	— 651	— 1,054	125.8
1976	— 939	+ 1,262	140.6
1977	— 1,495	+ 992	210.3
1978	+ 231	— 220	91.7

Table E-3

Estimated Capital Expenditures for Environmental Control Facilities*
With Projection for Future Years

Millions of Dollars

Year Facilities Began Operations	For Water Improvement	For Air Improvement	Total
1951-1965	$ 209.6	$ 238.8	$ 48.4
1966	18.8	37.6	56.5
1967	54.7	39.4	94.1
1968	61.5	20.2	101.7
1969	71.0	67.1	138.1
1970	110.0	72.6	182.6
1971	73.4	88.2	161.6
1972	57.0	144.8	201.8
1973	34.7	65.4	100.1
1974	79.4	119.4	198.8
1975	131.8	321.3	453.1
1976	158.7	330.5	489.2
1977	205.7	329.1	534.8
1978	180.8	277.2	458.0
Total 1951 — 1978**	1,510.2	2,223.1	3,733.3
Authorized for 1979 and Later	430.7	560.6	991.3

*Between 1951 and 1974 capital expenditures were for facilities placed in operation. Effective with 1975, the data represents actual capital expenditures made during the year.

**Includes capital expenditures in years prior to 1975 for facilities not placed in operation as of January 1, 1975: $63.1 million for water, $51.4 million for air, $114.5 million in total.

Source: American Iron and Steel Institute.